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LAND FORCE

LAND EQUIPMENT MANAGEMENT SYSTEM

(ENGLISH)

(Becomes effective on receipt.)

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FOREWORD

1. B-GL-342-001/FP-000 *Land Equipment Management System* is issued on the authority of the Chief of the Land Staff.

2. This publication is effective upon receipt.

3. Suggestions for amendments should be forwarded through normal channels to the Director of Army Doctrine, attention DAD 9.

4. Unless otherwise noted, masculine pronouns contained herein refer to both genders.

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CHAPTER 1
LAND EQUIPMENT MANAGEMENT SYSTEM

INTRODUCTION

1. The complexity and cost of expensive modern weapons systems and combat vehicles, and the extensive lead-time required for their production has made modern battlefield equipment a scarce resource. The support system of the equipment requires tight and efficient management practices, but must also be capable of operating and surviving under battlefield conditions. The Land Equipment Management System (LEMS) is a fully integrated, co-ordinated and self-sufficient system that encompasses the entire spectrum of equipment management and is designed to support from the factory right through to the front lines. **Equipment management is the process by which the equipment is planned for, acquired, fielded, maintained and disposed of**. An equipment is defined as all non-expendable items needed to equip a unit or a formation.[1] Organisations supporting the LEMS are responsible for maintaining the capability of the commander's equipment at the state of readiness that is required to support the plan.

2. LEMS is not a cap-badge doctrine. It does not demand the creation of "LEMS Units" or LEMS technicians in the foreseeable future though certainly the tie between doctrine and structure must continue to be a goal of future army designs. The Logistic (Log) and Electrical and Mechanical Engineering (EME) branches will perform the bulk of the tasks though supply and transportation units and maintenance units respectively. Staffs who perform LEMS functions will also be predominately Log and EME as well, though at some levels civilians, Combat Arm and Combat Support Arms will be employed. Reservists will certainly contribute through individual augmentation as they have done in the past, and perhaps will gain wider roles in the future.

3. This doctrine presents a new concept to the army, stressing "equipment capability" over past maintenance and supply "stove-

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[1] A-AD-121-00/FP-001

piped" doctrine. It is the aim of this doctrine to create and employ equipment management staffs who combine knowledge of maintenance and inventory control to provide the commander a single point of contact for all land technical equipment-related issues. Whether this capability comes from the repair of damaged equipment, or the issue of replacement equipment is an issue of little concern to the commander.

4. Given the creation of Close Support (CS) and General Support (GS) Service Battalions between 1996-2000, there will be likely no major changes to current unit structures anticipated as a result of this doctrine. Most notably, there must be a closer relationship developed between the traditionally separated maintenance and supply functions within staffs and units. Within higher headquarters (Land Forces Area, Area Support Group, Brigade Headquarters, etc) an "Equipment" (Eqpt) or "LEMS" staff position should be created to reflect the broader perspective of this capability manager. Within a typical army unit, a maintenance element should have increased line item issuing authority, capable of issuing replacement equipment and important B Class components (also called Line Repairable Units or Critical Assemblies). No longer should the unit have to see both the maintenance element **and** the quartermaster to achieve a serviceable vehicle.

5. This manual is part of a family of doctrine manuals. Though supply and distribution are obviously critical aspects of LEMS, the doctrine for them is found in *Replenishment* B-GL-341-001/FP-001. This manual describes the overall LEMS, with an emphasis on the management of LEMS (staff roles and tasks) and maintenance. CSS Units in Battle B-GL-345-001/FP-001 provides the doctrine for how these units operate on the battlefield. The unit structures are found within the Electronic Battle Box Version 2.1 (EBB v2.1). Note that the units performing the National Support Element (NSE) role, the Canadian Support Group (CSG) and Canadian Medical Group (CMG), are based on doctrine written outside the army. This doctrine is in the process of changing, thus this manual will usually refer to NSE vice CSG/CMG or other specific titles that may soon be superseded.

6. It is important to note that it is the term "land" does not equate to "army". LEMS is applicable to all land-based equipment used by all components of the CF.

ROLE

7. **Role**. The role of the LEMS is to maintain the operational capability of all land technical equipment.

8. The LEMS is responsible for land technical equipment including:

a. vehicle fleets of the Land Force and of the land-based elements of all services;

b. army weapons systems including small arms used by all services;

c. electrical, electronic and optronic equipment of land-based elements;

d. land tactical communications and information systems;

e. aircraft/airfield ground support equipment; and

f. land-based nuclear, biological and chemical defence equipment.

9. There are groups of equipment that are not the responsibility of the LEMS. These groupings are not all encompassing, and periodic adjustments of LEMS responsibilities are required, particularly when new technologies are introduced. These groupings are:

a. infrastructure and buildings, which are the responsibility of construction engineering elements;

b. strategic and single user communications and information systems, which are the responsibility of the Defence Information Services Organization (DISO); and

c. non-technical items that are not expendable, for example tents and furniture, are managed through the replenishment system, though repairs may take place at supporting maintenance facilities.

10. The Classes of Supply which are managed within LEMS are:

a. Class II—Limited to certain technical items within this class;

b. Class VII—Major end items (replacement vehicles); and

c. Class IX—Repair Parts.

THE REQUIREMENT FOR LEMS

11. The requirement for a LEMS comes from looking at the acquisition and support functions of combat equipment at all levels (industry to foxhole) and through a process perspective (cradle to grave). In generic terms, the environment of the LEMS can be described as follows (Figure 1-1):

a. At the strategic level, broadly speaking, the CF defines its mission using Defence White Papers and expresses it using Defence Planning Guidance. The Army receives it mission, and generally requires two major capabilities to perform that mission: personnel and materiel[2]. From a process perspective, we can establish the requirement for a Personnel Support Process and the Materiel Acquisition and Support (MA&S) Process.

b. Led by the requirement, the mission of the Personnel Support Process would be to generate and support the personnel required by the Force. To accomplish this it will recruit, train, maintain (administratively and medically) and retire personnel. These processes are covered in B–GL–343–001/FP–001

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[2] **Materiel** is defined as "moveable property and all assets, including equipment and stores, other than money and real property. It comprises: raw materials and manufactured products…" It is comprised of **Equipment**, (non-expendable or repairable items) and **Material** (expendable or consumable items).

Health Support Services (HSS) and B–GL–344–001/FP–001 *Personnel Administration in Combat* and will not be discussed further here.

c. Led again by the requirement, the mission of the MA&S Process is to generate and support the required materiel to the Force. To accomplish this it will be responsible for all aspects of the MA&S process activities (acquisition to disposal). The Materiel System (MS) is the organizational and functional structure that would perform the MA&S Process. The two "pillars" of the Materiel System are the Replenishment System, which is directly responsible for the support of the Force's land material and LEMS which is directly responsible for the support of the Force's land equipment.

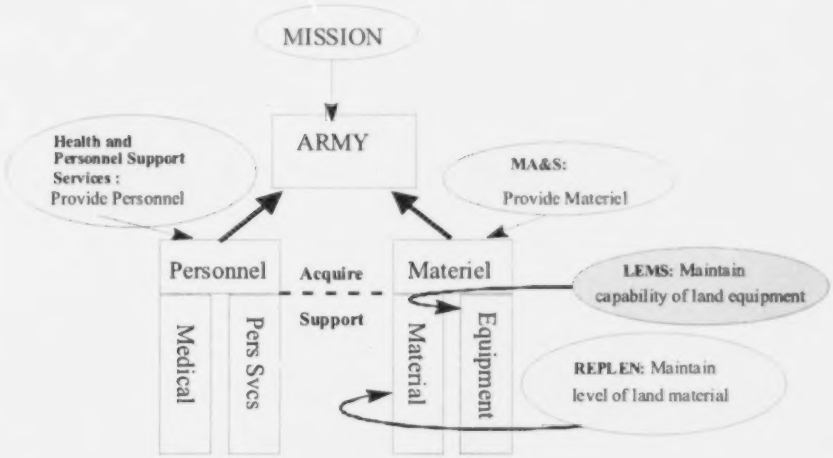

Figure 1-1: Requirement for LEMS

PRINCIPLES AND TENETS

12. **Principles of LEMS**:

a. There are six Principles of Sustainment[3], which have been distilled from the Principles of War and the

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[3] B-GL-300-4 Chapter 2

Principles of Administration, which continue to be relevant to LEMS:

(1) foresight,

(2) simplicity,

(3) economy,

(4) flexibility,

(5) co-operation, and

(6) self-sufficiency.

b. In addition to the six principles of Sustainment listed above, the Role and Tasks of LEMS derive three more. LEMS commanders need to strike a balance between the demands of these, often conflicting, principles as they assess the operational, technical and administrative requirements of their units. These three additional principles are:

(1) **Stability**. The degree of stability allowed by the tactical situation governs the amount of equipment support that can be carried out and consequently has an overriding effect on the whole organization and its method of operation. Increasing stability, both physical and organizational, has the effect of increasing production. Lack of stability, perhaps more significantly, has the effect of reducing production. Within the LEMS, the increased availability of maintenance resources lessens the requirement for spare equipment and increases the operational availability of usually limited equipment resources.

(2) **Protection**. LEMS organizations must be capable of self-protection. This can, however, have the effect of reducing output

if technicians are busy protecting themselves from enemy aggression. Commanders must therefore utilise all available resources to provide a secure working environment, commensurate with the tactical situation and priorities, at minimum cost to the technical manpower available. Another aspect of protection is that LEMS organizations must be equipped to the same level of protection and mobility as the supported unit or formation.

(3) **Co-ordination**. The range and distribution of equipment for which LEMS is responsible dictates the need for a wide variety of organisations to form the system. To manage these resources efficiently, LEMS activities must be co-ordinated at the highest level possible, yet executed at the lowest level and as far forward as possible. A disciplined and common-sense approach is required when co-ordinating LEMS activities, while complying with operational priorities and technical procedures.

13. **Tenets of LEMS**. The following is a list of the tenets of the LEMS which form the basis upon which the system's policy and procedures are built:

a. Provide equipment support as far forward as possible.

b. The preventive maintenance programme, including technical inspections, is essential to ensure maximum operational capability of the equipment.

c. LEMS organizations must be mutually supportive and their task assignments must be flexible. Higher units will be expected to support lower, and all

organizations must be prepared to provide support outside their normal level[4].

d. The generation and dissemination of technical information is essential for effective equipment support decision making at all levels. Technical information is the lifeblood of the LEMS. Every technician requires the most up-to-date and complete information to diagnose faults and to repair equipment. Maintenance commanders at all levels require correct and current information to make best use of critical LEMS resources and to provide correct advice to operational commanders. Equipment faults, problems and shortcomings in procedures can only be corrected if they are identified and reported. All elements of the LEMS must be involved in the collection, production and dissemination of accurate and timely technical information—it is the key to the continuing responsiveness and flexibility of the LEMS.

e. There must be a suitable equipment reserve, based on the operational situation. It is a reality of current defence spending that the LEMS must be precise enough to restrict this reserve to the minimum requirement.

f. In addition to their technical role, all LEMS personnel and LEMS organizations must be trained and equipped to fight in their own defence. To ensure the availability and survivability of equipment support in an operational theatre, all LEMS personnel must be soldiers as well as being technical experts.

g. Maintenance support is most effective when maintenance commanders have direct technical control of all LEMS resources. Effective

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[4] See Annex A for a narrative example from World War Two.

maintenance support depends on having the right resources at the right place at the right time. This can best be achieved when maintenance commanders have direct technical control and can therefore optimize the utilization of all LEMS resources.

h. The LEMS must have engineering and fabrication resources. To support equipment in an operational theatre, the LEMS must be able to respond quickly to technical problems and new situations. This requires not only the capability to engineer and realise effective ad hoc solutions to problems, but also requires the capability to fabricate from time to time components which are not available through normal means.

LEMS AND THE LEVELS OF SUSTAINMENT[5]

14. The support that the LEMS provides throughout the different levels of sustainment can be described as follows:

a. **Strategic Level**. At the strategic level, the LEMS is concerned with generating new equipment to sustain the Army to accomplish national goals. The players at this level include the military that defines a requirement for equipment, the Government who provides the funds and industry who produce the goods. The relationship between them is not linear. As examples, industry may produce equipment before the military has considered the requirement,

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[5] A word on "Lines of Support" – this terminology was dropped from Sustainment Doctrine but it remains a useful and popular method of describing the various echelons of support, such that NATO is considering adding this concept to its doctrine. The unofficial definition is: "Lines - In land operations, the echelon at which a combat service support function is performed. "First line" is the support organic to a unit; "second line" is the support organic to a brigade and division, "third line" is provided by corps and NSE, and "fourth line" is the national base – level support."

and politicians may direct certain purchases for reasons other than the "pure" military requirement. Within the Department, ADM (Mat) and the Director General Land Equipment Program Management (DGLEPM) are the main organisations that executes the LEMS strategic functions, along with other elements of NDHQ. Within the Land Staff, Director Land Requirements (DLR) is the significant partner to DGLEPM. The strategic support includes: research and development, major crown acquisition, engineering and design, provision of a maintenance plan, distribution plan, life cycle management, individual technical training and LEMS policies, directives, procedures and doctrine. The use of integrated teams to manage an equipment, or group of technically related equipment, is essential for the efficient management of equipment at all levels of the LEMS.

b. **Operational Level**. At the operational level, the LEMS is designed to provide and maintain equipment capability required to support the military campaign needed to win wars. This includes the management and maintenance of theatre stocks of equipment, managing the link to the strategic level and reinforcing the tactical level capabilities. Specifically it includes major repairs (also termed "heavy" repairs), reconditioning of major assemblies, inspection and certification of equipment arrivals, in-theatre equipment acquisition, inventory control, technical training, preservation, salvage, backloading and equipment condemnation and disposal. Important staff functions occur at this level such as campaign planning and the co-ordination of equipment support from host nation, allied military forces and contractors.

c. **Tactical Level**. At the tactical level, the LEMS is concerned with maintaining equipment capability needed to win battles. This includes restoring the capability of equipment through repairs and limited equipment replacement. It must be ready to function on the battlefield, requiring increased emphasis on

self-protection, mobility and responsiveness to the supported unit.

15. The terms strategic, operational, and tactical are often applied to units, depending on the level they support. Location of the units is also a consideration: strategic level units are those based in Canada, operational level units are those located in the Communication Zone, and tactical level units are those found within the Combat Zone. It is important to note that the levels of sustainment overlap, and units supporting various levels may be found throughout a theatre. For example:

a. Elements of strategic support may operate within a theatre, such as a team from industry which go afield to perform a modification.

b. Operational level units will include tactical support functions to perform a self-supporting mission, or to reinforce the tactical level.

c. A tactical level unit could have strategic effect depending on the unit's impact on the conflict. The inverse is true as well; for example a strategic bomber can easily be used to support the close battle.

16. **Support Mission**. There are three possible support missions that are carried out by LEMS elements:

a. **Integral Support**. The ***immediate*** (requires the element to be organic) support provided to a unit to deal with tasks of immediate concern to its operations. Though crucial to the tactical level of LEMS, elements performing this mission are found in units at all levels to ensure their organic equipment capabilities are maintained.

b. **Close Support**[6]. The ***intimate*** (requires the element to have a high level of mobility) support provided to a formation to deal with tasks of immediate concern to his operations. This is support to ***critical*** (or battle-winning) equipment provided as far forward as is possible using Mobile Repair Teams (MRTs). It is the commander and his staffs who decide what is considered critical, and this decision is required early in the campaign planning process. This mission is also most critical at the tactical level of LEMS, though all formations require this support.

c. **General Support**[7]. This is support provided to the force as a whole and not to any particular sub-division there-of, thereby supporting the operational level of LEMS. This mission also includes the responsibility to reinforce CS and Integral Support when required, and to support non-critical equipment of combat formations. This aspect of the support mission supports the tactical level.

PROCESSES AND TASKS

17. **Processes**. The LEMS is made up of a number of equipment management processes, some of which are carried out at all levels.

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[6] This term is not synonymous with "Direct Support (DS) as used by the US, "a mission given to supply, services, transportation, and maintenance units that normally provide support directly to other specific units. This allows the direct support unit to respond directly to the supported unit's requests for assistance or supplies." Both the UK and CA use CS, which narrows the definition and focuses on support to critical equipment.

[7] The CA use of this term is a combination of the definitions used by our allies. The US see GS as a mission given to supply, services, transportation and maintenance units that normally provide support to DS units and other GS Units – they are found in echelons **above division**. The UK see it as that CSS activity carried out to a greater depth where security is needed to generate work which is ultimately to benefit the fighting formation supported. They have GS companies **above brigade**.

These processes, and their relative importance at the three levels of sustainment, are illustrated in Figure 1-2 and are:

a. research and design,

b. acquisition,

c. maintenance (includes repair and recovery),

d. engineering change,

e. planning,

f. advice,

g. inventory control, and

h. disposal.

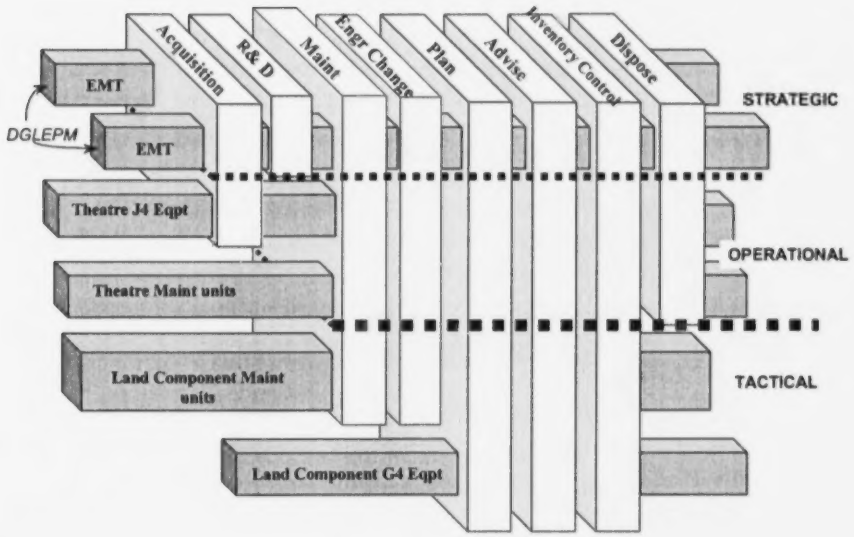

Figure 1-2: LEMS Processes

18. **Tasks**. The tasks of the LEMS are:

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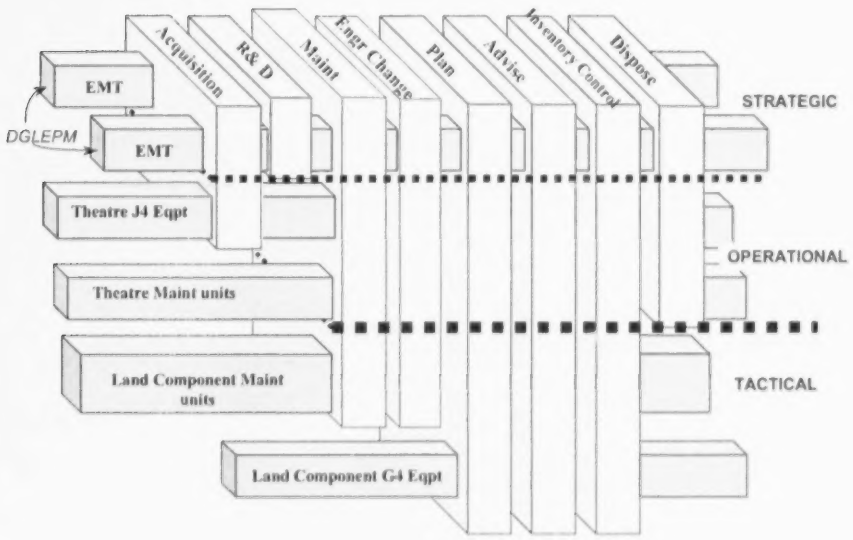

Figure 1-2: LEMS Processes

18. **Tasks**. The tasks of the LEMS are:

a. **Repair**. The corrective maintenance activity which restores an item to serviceable condition by correcting faults or replacing unserviceable pieces of the item with new, overhauled, rebuilt or reconditioned components. The DGLEPM Equipment Management Teams (EMT) will proscribe an equipment's repair concept, using Integrated Logistic Support (ILS) principles in the acquisition phase or retrospectively for in-service equipment. The concept will include a description of its Permissive Repair Schedule (PRS) and will dictate the specific role that LEMS units will play in its support. These include:

(1) Preventive maintenance (inspections, servicing, retrofit, preservation, equipment restriction and preparation for special operations).

(2) Corrective maintenance (diagnosis, repair, rebuild and overhaul).

(3) Modification.

(4) Technical inspection.

(5) **Battlefield Damage Repair (BDR)**. BDR is the use of repair expedients of a temporary nature to repair equipment disabled on the battlefield, including damage caused by enemy action, normal failures and accidents. It is designed to restore damaged materiel to a battleworthy condition as quickly as possible. Damage assessment has to be done rapidly and must not always require the use of automated test equipment or sophisticated tools. Repairs may be limited to that necessary to limit further damage, and minimise the risk to crew/operators. Once the operational mission has been accomplished, specialized maintenance or repair to restore the

equipment to fully serviceable condition must follow BDR.

b. **Recovery**. Recovery will assist in getting equipment back into action with minimum delay. Recovery resources can also have a direct effect on the success of combat operations by keeping routes clear for the tactical and logistic movement of troops and supplies. Recovery includes:

(1) extrication and righting;

(2) backloading and cross loading;

(3) battlefield and route clearance; and

(4) support to obstacle crossings.

c. **Repair Parts Management**[8]. Repair parts management is a LEMS responsibility, however, the storage and distribution of the parts is carried out by supply and transportation units. Repair parts management functions include:

(1) **Management of Critical Assemblies (CA)**. Commanders and staff will classify certain assemblies as critical to the support of equipment, to be managed as part of the Equipment Controlled Stores.

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[8] Whether or not maintenance units should have repair part distribution responsibility is a matter to be debated. As a historical note the 4 CMBG Bde Gp Svc Bn located the RPPL under the Maint Coy for some years and then under Sup Coy in other years. The former made the most sense in operations, the latter was best in garrison. This manual, and the replenishment manual, suggest a mix of the two – the maintenance companies require their own supply section to meet their needs; in effect the EMAS section of the old repair parts platoon establishment is now owned by the maintenance company, while the remainder of the parts are owned by supply units. When Total Asset Visibility becomes a reality this doctrine will need review, as ideally anyone should be able to draw parts from anywhere.

Classification as a CA will be minimised and will depend upon a variety of factors, which will include cost, complexity, scarcity and fragility.

(2) **Scaling**. Forecasting of repair part consumption, based on reliability data and battle casualty estimates, will determine the quantity of parts and where they should be positioned to support the mission.

(3) **Tracking of Repair Parts**. Global visibility of the location and condition of stocks and assets, by all authorised LEMS members, is critical to their effective and efficient use. The increasing use of information systems will enable this function and eventually allow increasingly scarce stocks to adequately support the equipment inventory.

(4) **Initial Provisioning** (for new equipment). This provides the initial scale of parts to new equipment as determined by EMTs.

(5) **Procurement** (including robbing, cannibalisation and salvage).

(6) **Storage directives** (for example impacting on shelf life).

(7) **Co-ordinate maintenance of non-serviceable parts** (manage returned repairables).

(8) **Disposal**.

d. **Technical Training**. The LEMS is required to ensure that its soldiers possess the required skills and knowledge to successfully perform all equipment management tasks throughout the Levels of Sustainment. The decentralised nature of the

LEMS support concept often requires small teams to perform their tasks in total isolation; thus the vital requirement for junior personnel to be highly trained over a broad spectrum of functions. Furthermore, to cope with modern battlefield technology, LEMS personnel are trained to very high technical levels. Formal training mostly occurs at the Logistic and EME branch schools, and, to a lesser degree, in the field for locally acquired equipment. On-the-job training is continually performed in units and LEMS commanders and staffs are responsible to ensure that the technical expertise of their troops is maintained.

e. **Equipment Inventory Management**. This task relates to acquisition, fleet management and disposal. The LEMS ensures that the entire life cycle is considered such that new equipment is selected that can perform the mission reliably and is stocked in sufficient quantity, and that its serviceability is measured to ensure the necessary level of readiness. This applies whether acquiring a complete fleet of Light Armoured Vehicles by DGLEPM, or chain saws by the unit quartermaster. When equipment can no longer perform its function, the LEMS will ensure that it is condemned and disposed of in accordance with policy.

f. **Technical Information Management**. All equipment, either new or legacy, have a wealth of technical information associated with it. The information will be of two main types, which need to be carefully managed by the LEMS:

(1) **Product Data (PD)**. The vast majority of PD is in paper form in Technical Manuals (TM) and Spare Parts Lists (SPL). The new trend however is towards electronic creation, storage and delivery of technical information in the form of the Logistic Support Analysis Records (LSAR), Integrated Electronic Technical Manuals (IETM) and Interactive SPL (ISPL). This information will either be provided by the

Original Equipment Manufacturer (OEM) or will be generated by the In-Service Manager, in the EMT, for use by the operators and maintainers of the equipment.

(2) **In-Service Data (ISData)**. ISData is the data built up by the operators, maintainers and managers of the equipment during its in-service life. It will consist of owner/location, configuration, reliability, availability and maintenance histories. This information is critical to the Engineering Change (EC) process, mid-life spares scaling and eventual replacement programmes. It should be collected at unit level, managed at fleet level and made available to all.

g. **Technical Advice**. Providing technical advice to commanders and other staffs on matters affecting the operational capability of land technical equipment is an important task. Technical advice includes:

(1) providing land equipment capability advice to CF and other interested parties;

(2) co-ordinating the flow of land equipment capability advice between parties;

(3) maintaining an awareness of related industrial and allied force equipment capabilities;

(4) developing and promulgating LEMS policy and procedures; and

(5) supporting LEMS staffs in subordinate headquarters.

MANAGEMENT OF LEMS

19. At the strategic level of sustainment this function is carried out through national technical authorities (TA), the life cycle materiel managers (LCMMs), who exercise this function through national policies and guidelines. During operations commanders and staffs at all levels further define management policies and directives to maximise the capability provided by the resources under their control. The key equipment management points within a theatre are the following:

a. **Commanders and Staffs**. They determine policy, priorities and plan and design the concept of operations for campaigns and battles. They set the policies and give direction that balances the prompt replacement requirement of the tactical user against the conservation of inventory demanded to support a lengthy operation or campaign. While the G3 branch of the staff will design the battle, designating main effort units and hence assigning priorities for LEMS support, it is the J4/G4 Eqpt who will provide the expertise to base these decisions upon. It is the J4/G4 Eqpt who will manage all equipment-related issues as operations commence.

b. **Materiel Management Centres (MMC)**. These are control points located within the JTFHQ, NSE, COSCOM, and DISGP that manage the daily business of LEMS, including equipment and maintenance resources. They are not just concerned with material (consumables). They are more than a co-ordination centre, and issue direction to the support units for action.

c. **LEMS Support Units**. They manage their resources to execute the support mission, repairing, issuing replacements, etc.

TECHNICAL AUTHORITIES

20. A technical network of experts supports the equipment management system. The LCMMs in NDHQ provide advice and direction on how best to maintain the capability of the fleet they manage. In the field, a similar role is performed through persons with designated levels of technical authority. Commanders, through their LEMS staffs control this process and within the limits set by national LEMS policy guidelines, define whom the technical authorities are, and assign limits to their authority.

21. Normally the positions, which are allocated technical authority are as follows:

a. **TF J4 Eqpt**. The theatre level authority limits are set by NDHQ in consultation with the TF J4 Eqpt. His staff is designated as his technical authority responsible for establishing theatre technical policies for the TF. Their authorities are usually expressed in the form of dollars that can be expended on a given equipment, and focus on disposal or repatriation of equipment decisions. They also extend the technical liaison to allies, host nation, etc, to achieve a comprehensive theatre LEMS network.

b. **Formation G4 Eqpt**. This staff is responsible for establishing technical policies for the formation.

c. **Technical Inspectors (TIs)**. Technical Inspectors are appointed throughout formations to manage the technical authority at the lowest level. These are an organised body of experienced and knowledgeable Warrant Officers and Senior NCOs who make many of the technical decisions required to operate the routine processes of LEMS. They control the gateways into the various maintenance facilities to ensure the equipment goes to the correct facility, and make the repair or replace decision as far forward as possible. They operate from maintenance facilities, and in particular Equipment Collection Points. Supply units may also have TIs in support of the repairable line items they manage.

LOGISTIC UNITS AND LEMS

22. Both supply and transportation units support the LEMS. Doctrine for these units is found in *Replenishment* B-GL-341-001/FP-001, and CSS Units in Battle B-GL-345-001/FP-001. The units to be considered are:

a. **Supply Units**. Supply units exist at all levels primarily performing a warehouse function for all classes of supply. The Canadian Forces Supply System is vital to equipment inventory control and provides asset visibility over all repair parts in the theatre.

b. **Transportation Units**. These are needed to perform the distribution function for all classes of supply. They also support the movement of the operational level units, many of which are not capable of self-lift. They hold the majority of the tank-transporters and lowbeds and can assist EME units conducting backloading.

c. **Movement Units**. These manage the distribution system including asset tracking and the operation of rail and air-terminals.

EME UNITS AND LEMS

23. EME units (generally referred to as maintenance units) are the focus of this manual as they perform the majority of LEMS tasks on the battlefield.

24. **Structure of EME Units**. A maintenance organisation must have the capability to perform the following functions:

a. **Command**. This function includes those activities necessary to direct the unit or formation towards accomplishing its mission and includes discipline, morale, etc.

b. **Workshop Support**. This includes:

(1) **Production Planning and Control**. Planning involves forecasting and assigning resources in order to complete future missions. Control includes the assignment of production resources, in accordance with plans, and the adjustment of the resource allocations or the plan as required. Planning and control are dependent upon each other and are considered to be a combined function. Control includes the IN and OUT inspection process.

(2) **Technical Administration**. This includes all technical records, data gathering and reporting necessary.

(3) **Repair Parts Scaling**. The scaling of repair parts will determine the stocking plan for parts, and is a significant part of the planning process.

(4) **Supply**. Each organisation within the LEMS has an integral supply organisation to provide repair parts and repairable units, which meets the requirements of the production organisation.

c. **Production**. This function is the provision of LEMS service to the equipment held by the supported unit or formation. It is the primary function.

d. **Unit Administration**. This function includes all of the non-technical administrative matters, which must be completed in support of a LEMS unit operations.

25. Though the structure of the doctrinal maintenance elements is outlined in EBB v 2.1, it is necessary to understand how the structure was developed. The structure of maintenance units is influenced by the following factors:

a. **Support Mission**. A unit will be designed in accordance with the mission performed:

(1) integral support—mobile, workshop and MRT operations,

(2) close support—mobile, MRT operations, and

(3) general support —mobile or semi-mobile, workshop operations.

b. **Level of Maintenance**. The level of maintenance is a measure of the maintenance/engineering content **and time** required performing a task. Tasks are classified into levels to guide users of this doctrine as to the extent of work that should normally be performed by maintenance units, and PRS are based on this guide. The level of maintenance can significantly affect the structure of maintenance units. Tasks with significant engineering content can require special equipment and skills to accomplish. Units that are not often expected to move can best carry out tasks requiring a long time to conduct. In keeping with the LEMS tenet, any unit can be re-roled, with consideration of the resource requirements. The Levels of Maintenance are:

(1) **Level One**. Level one includes operator maintenance[9] and preventive maintenance such as servicing, preliminary diagnosis of faults and corrective maintenance tasks of a minor nature. The term "minor nature" infers short duration (less than four hours),

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[9] A-LM-158-005/AG-001 provides the broad doctrine for the management of operator maintenance programs. The Fleet Management System will be the Information System that supports this task. A unit Tpt O should provide this management function. Operator duties are further detailed in vehicle operator manuals and related CFTOs.

and relatively simple repairs. Further information on operator maintenance is found in A-LM-158-005/AG-001.

(2) **Level Two**. Level two includes corrective maintenance by repair or replacement of parts and assemblies, limited only by time (this limit is campaign dependent, but usually is limited to 24 hours).

(3) **Level Three**. Level three is responsible for corrective maintenance of longer duration than level two, reconditioning of assemblies, rebuild of minor components, limited calibration, reclamation and limited manufacture.

(4) **Level Four**. Level four is responsible for the complete overhaul of equipment. This includes complete fabrication or manufacture to design specifications, retrofit, mid-life improvements and likely a production line capability. It is a permanent facility normally outside a theatre of operations, either 202 Workshop Depot or a civilian manufacturer.

c. **Modularity**. The commander must have the capability to group his forces to achieve his aims, and thus these maintenance units must be of a self-sufficient and modular in nature to allow task tailoring. As an example, the commander's main effort may be supported by more than its normally allotted maintenance units for a particular time, or task. It is for this reason that maintenance elements are formed into sections, platoons and companies. Regrouping is usually carried out at the company and sometime platoon level.

d. **Function**. Organising by type of repair or maintenance function emphasises efficient production through the concentration of specific

skills, tooling and parts. This functional structure is also best suited to theatre level organisations where production is the priority. Depending on the size of the force supported this functional structure may include platoon or company level. The functions are generally as follows:

(1) **Automotive Repair**. Generally over 50 percent of LEMS manpower is dedicated to this support. Vehicle maintenance sub-units are normally further divided due to the trade training and tooling requirements peculiar to each family of vehicles:

(a) **A Vehicles**. This family includes all armoured vehicles.

(b) **B Vehicles**. This includes non-armoured vehicles.

(c) **C Vehicles**. This includes non-armoured engineer support equipment.

(2) **Recovery**. This includes the extraction capability for all vehicle fleets, and the use of lowbeds, etc for cross loading and back loading operations. Transportation units also contribute to this latter capability.

(3) **Materials**. The materials function includes provision of welding, machinist and other support services depending on the supported organisation's needs.

(4) **Other**. Other repair organisations include weapon systems, optical, electronic, communications, radar and miscellaneous equipment. These may be section or platoon-sized organisations depending on the volume of equipment they support. The term "Ancillary" is applied to a

maintenance element that combines a variety of these functions. This is usually done for control or administrative purposes, not for tooling/training reasons.

e. **Flexibility**. A maintenance unit provides the most flexible support when it is a composite unit, that is, made up of various functional elements. Flexibility comes at the cost of reduced efficiency compared with the function-based organisation, as it usually requires increased redundancy of resources. But on a fluid, non-linear battlefield the split of capabilities may be required, whether it is due to long or insecure lines of communication, or to provide better survivability.

26. **Types of Maintenance Units**:

a. **Integral**. These platoons are found in all army major units and perform the Integral Support mission. The ***immediate*** support is provided through a mobile repair facility and MRTs. This support includes operator maintenance, preventive maintenance and servicing, preliminary diagnosis of faults, and corrective maintenance tasks of less than 4 hours. These elements have the recovery resources needed to support their movement, and recover casualties to the Equipment Collection Point (ECP).

b. **Close Support**. These provide intimate support to critical equipment. Maintenance units in support of critical equipment are mobile (capable of moving in one lift with the supported formation), and are designed to provide the support as far forward as is possible using MRTs. MRTs operate specialised repair vehicles with armour and mobility commensurate with the equipment they support and where they operate on the battlefield. The maintenance carried out includes corrective maintenance by repair or replacement of parts and assemblies taking less than 24 hours to perform. A static operation may see this limit lengthened by the

commander and staff, and the converse is true for highly mobile operations. They have limited recovery capability, mainly to augment the units. They would not normally operate ECPs, as these points generally support the repair of non-critical equipment, and are not mobile.

c. **General Support**. These units may be mobile if required to operate in the combat zone, or semi-static (requires additional lift or multiple trips to accomplish a move) if operating in the communication zone. These elements provide a broad range of maintenance support:

(1) Corrective maintenance including extensive accident or battle damage repair to all equipment, reconditioning of assemblies, rebuild of minor components, limited calibration, reclamation and limited manufacture. These functions are provided through centralised workshops, operating in the communication zone.

(2) These units may also provide Integral and Close Support to those units and formations without such support or to reinforce designated units or formations.

(3) These units also support non-critical equipment of combat formations, through centralised workshops. The corrective maintenance is usually limited to 36 hours as the function takes place in the combat zone, and it must be able to keep up with the formation it supports. Elements providing this support are usually mobile.

(4) These elements hold the majority of recovery resources in theatre. They are responsible to establish ECPs, including providing the command element and

backloading the equipment to the appropriate repair facilities.

d. **202 Workshop Depot**. This unit is responsible for the complete overhaul of designated equipment as directed by DGLEPM, and it supports the equipment stocked by 25 CFSD. It has the capability to carry out complete fabrication or manufacture to design specifications, retrofit and mid-life improvements.

e. **Civilian Contractors**. Civilian contractors will be providing maintenance support within a theatre of operations, and certainly in Canada as well. They will not normally be found operating within the combat zone, but this is dependent on the threat.

Function	Task	Unit	CS	GS Fwd	GS Rear	Depot	Contractor
AUTOMOTIVE	Critical Vehicles	1	2	2	2,3	4	
	NON-CRITICAL VEHICLES	1		2	2,3	4	
	Components/Power Pack Reconditioning			3(-)	3	4	
	Generators	1		2	3	4	
RECOVERY	Extrication	X	X	X	X		
	Establish ECP		X(-)	X	X		
	Backloading	X		X	X		
	Battlefield Clearance			X			
	Obstacle Crossing Support	X	X	X			
WEAPONS	Leopard Tank	1	2	2	2,3	4	
	M109	1	2	2	2,3	4	
	Cougar	1	2	2	2,3	4	
	Grizzly/Bison	1	2	2	2,3	4	
	Coyote/LAV 3	1	2	2	2,3	4	
	Giat/C3 (105mm)	1	2	2	2,3	4	
	AT Weapons(Mounted)	1	2	2	2,3	4	4
	AT Weapons(Dis-mounted)	1	2	2	2,3	4	4
	Small Arms	1		2	2	4	
	Security Container	1		2	2	4	

FCS	Grizzly/Bison		2		3	4	
	Leopard Tank	1	2		3	4	
	M109	1	2		3	4	
	Cougar	1	2		3	4	
	LAV 3	1	2		3		4
	Coyote	1	2		3		4
	TUA	1	2		3		4
	TOW	1			3		4
	Night Vision Equipment				3		4
	TVIGS				3		4
	Eryx				3		4
	Air Conditioning	1			3		
	General Electrical	1					
	Calibration				3	4	4
MATERIALS	A Vehicle Welding	1	2	2	3	4	4
	B Vehicle Welding	1		2	3	4	4
	Machining			2	3	4	4
	Paint/Body	1		2	3	4	4
	Textile			2	3	4	4
	Manufacture			2	3	4	4
COMMS Eqpt	Radio	1					4
	Telecommunications	1			3		4
	ADP	1			3		4

Figure 1-3: Task Division between Units Showing Level of Maintenance Performed

NATO AND ABCA OPERATIONS

27. Canada is a participant in NATO and ABCA, and both contribute to the development of coalition doctrine manuals through representatives from the Directorate of Army Doctrine (DAD) who participate in various forums. The OPI for sustainment doctrine is DAD 9-2. LEMS is coalition doctrine that goes through a ratification process and the principles are used in our manuals as much as our national concerns allow. A complete set of references is available through NATO and ABCA websites and will not be duplicated here in whole. Some of the important references are:

a. **NATO**:

(1) Policy MC319/1, MC326/1, MC336/1;

(2) Joint Doctrine AJP-1(A) and AJP-4;

(3) Component Doctrine ALP-9(C) *Land Forces Logistic Doctrine* and ALP-11;

(4) Techniques and Procedures Bi-MNC Dir HNS, Bi-MNC Dir MJLC, STANAG 2034, STANAG 2156, STANAG 2399;

(5) AEP-13 2375 NATO *Battlefield Recovery Data / Données OTAN relatives à la recuperation sur le champ de bataille*;

(6) AEP–16 NATO *Vehicle Recovery Operation*; and

(7) AEP-17 2400 *Battlefield Vehicle Recovery – User Handbook / Récupteration des vehicues sur le champ de bataille - manuel de bataille — Manuel de l'utilisateur.*

b. **ABCA**:

(1) *ABCA Coalition Operations Handbook*;

(2) QSTAG 0171 *Procedures for Requesting Repair and Recovery of Land Military Technical Equipment*;

(3) QSTAG 0972 *Materiel Salvage Procedures*;

(4) QSTAG 0973 *Materiel Disposal Procedures*;

(5) QSTAG 1149 *Standard Method of Preservation*;

(6) QSTAG 2020 *Coalition Logistics Planning Guide (CLPG)* ;

(7) QSTAG 0101 *Standardization of 2" Fuze Holes and Fuze Contours for Artillery Projectiles 75mm and Larger in Caliber Including 81mm, 4.2" and 107mm Mortars*;

(8) QSTAG 0264 *Lunettes, Pintles and Emergency Towing Facilities*;

(9) QSTAG 0284 *Fifth Wheel Attachment*;

(10) QSTAG 0310 *Braking Systems Between Towing and Towed Units of Equipment Combinations for Military Use*,

(11) QSTAG 0327 12 *Point Electrical Connectors Between Military Vehicles*;

(12) QSTAG 0328 *Slinging and Tiedown Provisos for Lifting and Tying Down Military Equipment*;

(13) QSTAG 0330 *Sampling Procedures and Charts for Inspection by Variables for Percent Defective*;

(14) QSTAG 0335 *Certification of Ultrasonic Inspection Personnel*;

(15) QSTAG 0340 *Single and Multi-level Continuous Sampling Procedures and Tables for Inspection by Attributes*;

(16) QSTAG 0360 *Climatic Environmental Conditions Affecting the Design of Military Materiel*;

(17) QSTAG 0670 *Standardization of Proof Philosophies and Practices for ABCA Guns, Mortar, Ammunition and Equipment Utilized at Proof Ranges*;

(18) QSTAG 0710 *Software Quality Assurance System Requirements*;

(19) QSTAG 0724 *Calibration of Ultrasonic Test Equipment with Standard Test Blocks*;

(20) QSTAG 0763 *Proof of Mortar Ammunition*;

(21) QSTAG 0771 *Personnel Qualification for Liquid Penetrant Inspection*;

(22) QSTAG 0779 *Failure Definitions and Scoring Criteria for Tank Automotive Equipment*;

(23) QSTAG 0906 *Auxiliary Power Unit Connections for Starting Combat and Tactical Vehicles*,

(24) QSTAG 0940 *Procedures to be Used to Assess the Extent of Wear in Artillery and Tank Guns*;

(25) QSTAG 0941 *Automatic Targets for Direct Fire Ammunition*;

(26) QSTAG 1033 ABCA *Materiel Configuration Policy*;

(27) QAP 0099 *Technical Data Packages (TDP)*;

(28) QAP 0185 *Whole Lifecycle Testing Requirements To Assist in the Purchase of Common and New Armament Systems Among ABCA Armies*;

(29) QAP 0187 *ABCA National Armies Policies and Countries Legislation with respect to the Environment*;

(30) QAP 0189 *National Quality Procedures and Practices*; and

(31) QAP 0246 *Life Cycle Testing of 7.62 mm.*

ANNEX A
THE CANADIAN KANGAROOS IN WORLD WAR II

1. It is a Tenet of LEMS that:

> LEMS organisations must be mutually supportive and their task assignments must be flexible. Higher units will be expected to support lower, and all organisations must be prepared to provide support outside their normal level.

2. The "Kangaroo", an infantry carrier in the form of an armoured tank, was capable of carrying a section of ten fully armed soldiers directly on to the objective in relative safety and usually without casualties. It was a Canadian invention developed on the battlefield, built by a flexible and potent force of maintainers.

3. It resulted from an instruction by General Crerar to General Guy Simonds that he was to plan a major operation on the axis Caen-Falaise to break through the German positions. General Simonds briefed his Divisional Commanders emphasizing a key point "Essentials are that the infantry must be carried in bullet-proof and splinter proof vehicles to the actual objectives". His plan required 60 such vehicles, thirty to each of the attacking divisions for the specific purpose of moving infantry at armour speed. Direction was given the evening of 31 July to DDME 1st Canadian Army, Brigadier G.M. Grant to convert 72 of the SP guns to APCs by 9 August. This date was soon changed to 6 Aug, with "as many as possible" by the night of 5 August.

4. They were to be based on US M7 105 mm SP guns (called "Priests") which had just been withdrawn from units of 3rd Division. RCEME technicians had to remove the 105 mm gun and mount, weld a plate over the resulting gap, and over-haul a number of components including the radial engine, transmission, control differential, brake linings and running gear. The engine overhaul alone normally would have required 7 days to complete.

5. Major G.A. Widgeon and the 250 men of his Army Workshops Detachment (AWD) were the site of the work, though fourteen Canadian and British units contributed and pooled their efforts and skills in the project. As it happens, the code name given to

the AWD was "Kangaroo", and that is how the new APC got its name.

6. On 1 August 1944, AWD Kangaroo was set up in two fields, about 20 miles from the Start Line. The hours of work were 0500-2200 hours. All RCEME units were canvassed for welding equipment and tradesmen, as well as radial engine parts and stands. The armour came from crocks, and when it ran out other sources were found—the Navy were soon complaining that Canadian soldiers were cutting plating out of craft stranded on the beaches. However this steel and other locally liberated plate was too soft, and a double plate system was developed to compensate.

7. By 2000 hrs on the 5 August 72 carriers were built, with an additional 6 ready by noon on the 6th. They went into battle on the 7/8th August, with results that fully justified the armoured infantry carriers and the strategy based on them. The attack on the two-Division front was a success and a six-day advance followed, leading to the closing of the Falaise gap and the destruction of a German Army.

References: *The Canadian Kangaroos in World War II*. Kenneth R. Ramsden, Ramsden-Cavan Publishing, 1997. See also *Canada's Craftsmen at 50, the Story of Mechanical and Electrical Engineering in the Canadian Armed Forces*. Colonel Murray C. Johnston

CHAPTER 2
LEMS AT THE STRATEGIC LEVEL OF SUSTAINMENT

INTRODUCTION

1. At the strategic level, the Land Equipment Management System (LEMS) is concerned with generating new equipment to sustain the Army to accomplish national goals. It is focussed within the resources and activities of the Equipment Management Teams (EMTs) of the Director—General Land Equipment Program Management (DGLEPM). In addition, a range of Canadian Forces (CF), Department of National Defence (DND), allied forces and industrial capabilities provide in-depth LEMS support services beyond those within operational and tactical level LEMS organizations, in both peace and war.

2. The LEMS doctrine was borne in National Defence Headquarters (NDHQ) to meet the needs of the strategic level of sustainment. It came from a recognition of a few new factors which have promoted the need for a seamless industry to foxhole system of support:

a. Shortages in resources, money and personnel, forced increased efficiencies. Stove-piped or functional staffs were not possible to maintain, and the multi-functional EMTs was created.

b. Increasingly, industry is becoming a partner with DND throughout the lifecycle of equipment. Previously they built the equipment and left the in-service support issues to DND staffs. Now, industry is expected to provide the equipment, the operator and technician training programs, the repair parts scale, the repair parts stock, and product data which will be the basis for the in-service support. They may be expected to provide in-service support, either in the context of a warranty, or continued in-service support instead of a military maintenance organization. Thus the strategic level is increasingly designing, and sometimes providing all levels of support.

MATERIEL ACQUISITION AND SUPPORT (MA&S) CONCEPT

3. The LEMS is a subset of the overall MA&S system of the DND/CF. The MA&S concept envisions seamless, end-to-end provision of equipment and associated support from industry through to the tactical units of any deployed contingent. Improvements in asset and consumption visibility throughout the support pipeline will enhance our ability to anticipate and respond appropriately to any arising demands. Delivery of effective MA&S will rely on the integration of industrial and defence capabilities to achieve optimum support with minimum consumption of resources.

4. **LEMS Sub-set**. The LEMS encompasses the full range of MA&S services, but limits their application to the land equipment capabilities of the CF. The a pre-dominant focus is on the optimal delivery of these services to deployable CF elements, particularly land forces and the land-based elements of other CF contingent forces.

EQUIPMENT MANAGEMENT TEAM (EMT) CONCEPT

5. **EMT Concept**. The management of MA&S equipment capabilities is based upon the Equipment Management Teams (EMTs) within DGLEPM, which have been organized into multi-skilled teams responsible for specific equipment capabilities. These teams combine staff and resources into a single team that manages the application of varied skills (in project, engineering, technical support, inventory, financial and procurement management disciplines) to full life cycle activities (of both acquisition and support phases) through the optimum application of diverse MA&S processes. By placing both a broad skill-set and full life cycle mandate within a single team, the EMT concept reduces information and responsibility handoffs. It also ensures that the EMT Leader is both empowered and charged with balancing resources across his assigned responsibilities. Lastly, it provides an integrated focal point to respond to needs and manage associated resources.

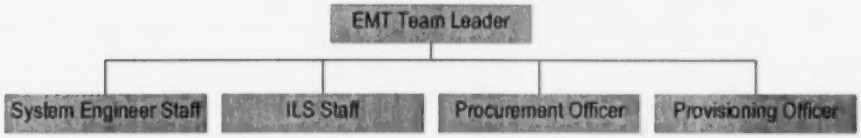


Figure 2-1: Typical EMT

6. While the EMT provides the core team focussed on delivering and sustaining equipment capabilities within DGLEPM, they achieve their program only through support from a number of others who are linked to specific EMT activities and projects through responsibility assignment matrices and agreements. These others will include:

a. The staffs of the Chief of Land Services (CLS), mainly within the Directorate Land Requirements, are the link to the user, they define the requirement or capability that must be met by the equipment. These staffs are essential members of the EMT.

b. Other staffs within lower level headquarters such as the Land Force Area HQs, 1 Canadian Air Division HQ, and within the CF national headquarters of any deployed operation, contribute to the strategic LEMS processes.

c. DND quality assurance staffs.

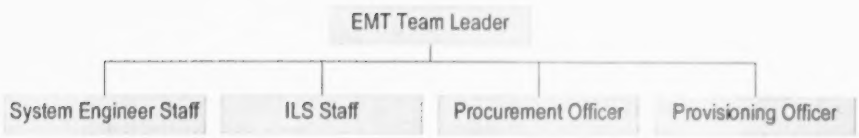
d. Procurement staffs of Public Works & Government Services and other purchasing agencies.

e. CF training schools and staffs.

f. Allied Forces and agencies.

g. Industry.

7. The EMTs within DGLEPM are currently organized into a number of sub-equipment program management directorates, as described below:



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c. DND quality assurance staffs.

d. Procurement staffs of Public Works & Government Services and other purchasing agencies.

e. CF training schools and staffs.

f. Allied Forces and agencies.

g. Industry.

7. The EMTs within DGLEPM are currently organized into a number of sub-equipment program management directorates, as described below:

a. **Director Armored Vehicle Program Management (DAVPM)**. EMTs responsible for Heavy Armoured Vehicles, Wheeled Light Armoured Vehicles (LAV) and Tracked LAV, as well as PMO LAV, which is not yet integrated into the EMTs.

b. **Director Support Vehicle Program Management (DSVPM)**. EMTs responsible for Light Standard Military Pattern (SMP), Medium/Heavy SMP and Mobile Support Equipment.

c. **Director Land Command Systems Program Management (DLCSPM)**. EMTs responsible for Tactical Communications Systems and Command Support and Information Operation Systems, as well as PMO TCCCS.

d. **Director Soldier Systems Program Management (DSSPM)**. EMTs responsible for Operational Clothing, Non-Operational Clothing, NBCD, Small Arms and Anti-Armor Weapons.

e. **Director Field Support and Common Equipment Program Management (DFSCEPM)**. EMTs responsible for Tactical/ Close Support Equipment (tactical power, tentage, heaters and decontamination systems), General Support Equipment (deployable camps and utilities), Combat Engineering Equipment (bridging, mine/countermine and engineer kits), Common Technical Equipment and Common Non-Technical Equipment.

f. **Director Artillery Systems Program Management (DASPM)**. EMTs responsible for Field Artillery Systems, Air Defence Gun Systems and Air Defence Missile Systems.

g. **Director Land Engineering Specialist Services (DLESS)**. EMT for simulation systems.

LEMS PRINCIPLES AT THE STRATEGIC LEVEL

8. While Chapter 1 outlines a number of principles common to LEMS at all levels, the following are provided to highlight their specific importance and application at the strategic level of LEMS:

a. **Awareness (Combination of Foresight and Co-operation with Coordination)**. Successful anticipation and satisfaction of needs within a theatre of operations must be based on the most accurate and timely information on equipment and equipment support system status, and on this information being available to all affected LEMS staffs and units. As response times tend to be longest within the strategic level of LEMS, staffs must use available information systems to maintain an awareness of:

(1) the performance of their equipment against current and future threats, and within current and future roles;

(2) the achieved availability of their equipment and the causes of non-availability;

(3) the state of their equipment support system, including stocks and response times; and

(4) the capacity of industry to meet current and future needs.

b. **Balance (Combination of Coordination with Economy and Flexibility)**. EMTs need to constantly balance resources and efforts across fleets and activities to achieve the optimum results within resource limits against defined and implicit needs of the deployed forces. EMTs will also need to balance resources and efforts committed to deployed forces against those required to create follow-on forces and to meet other defence needs. Achieving the correct balance will be part art and part science.

c. **Husbandry (Combination of Economy with Coordination)**. EMTs must continually husband limited resources to achieve the optimum results with those at hand. Care must be taken to avoid unnecessary expenditures in non-deployed equipment systems thus focusing more resources on sustaining those in use. Effective resource husbandry may also include recommending and executing major re-distribution of CF land equipment assets, particularly to support deployment of smaller forces on operations other than war.

d. **Responsiveness (Combination of Flexibility with Co-operation and Coordination)**. An effective strategic LEMS is responsive to both unforecast and planned needs from deployed forces and their supporting LEMS. Through continual examination and improvement, the velocity of strategic LEMS processes must be increased to shorten response times within acceptable risk levels, both before commencement of the operation and throughout it. Effective, direct feedback and communications on specific needs from theatre to EMTs is also to be expected.

e. **Anticipation and Transition (Combination of Foresight and Flexibility with Self Sufficiency, Coordination, Co-operation and Stability)**. The mounting, deployment and commencement phases of most operations will be largely dependent on equipment and equipment support capabilities that are established in peacetime to sustain general combat capable land forces and are constrained by peacetime resource limits. It is important that long-standing pre-established agreements exist with industry and with other strategic support agencies; and that, as much as possible, these agreements recognize and address the necessary surge capabilities to meet major CF commitments. Equally, EMTs must develop strategies to transition their peacetime equipment and equipment support

capabilities to meet the levels of use and related consumption for major operational CF missions.

KEY LEMS PROCESSES AT THE STRATEGIC LEVEL

9. LEMS executes almost the full range of MA&S processes to acquire and support the CF's land equipment capabilities. The following paragraphs provide an overview of the key processes executed by LEMS strategic elements:

a. **Equipment Program Management**. The strategic level of LEMS is charged with converting assigned generic resources (personnel and funds) into diverse land equipment capabilities that are used to achieve the missions and roles of the CF. To this end, strategic LEMS staff:

(1) define the land equipment program requirements for resources within the overall Defence Management System;

(2) estimate the impact of resource levels below those needed to meet the full requirement;

(3) direct EMT execution of the approved land equipment program, including integration of diverse EMT activities and related processes;

(4) manage and monitor resource expenditures and report results achieved against approved plans; and

(5) continuously improve their execution of MA&S processes related to program management.

b. **Project Management of All Activities**. Almost all LEMS strategic activities can be managed as projects (i.e. managed using generic project

management concepts to manage each activity from start to finish) within overall programs. EMTs and other LEMS elements shall be proficient at using the project management processes (of initiating, planning, executing, controlling and closing processes) and in applying them across the project management knowledge/skill areas of:

(1) scope management,

(2) time management,

(3) cost management,

(4) quality management,

(5) human resource management,

(6) communications management,

(7) risk management,

(8) procurement management, and

(9) project integration management.

c. **Capital Project Management**. A sub-set of LEMS processes is that set related to managing the acquisition and introduction of new equipment capabilities, termed capital project management. Here, in addition to using the generic project management processes above for internal management of the acquisition activity, LEMS staff are required to fulfill certain control, approval and performance reporting activities to link this major acquisition effort into the overall Defence Management System (DMS). The DMS Guide, available on the DWAN, provides more details on specific DMS capital project processes and structure. The bulk of capital project activities may be devoted to monitoring and comparing industry design and production of new equipment and the

associated support against CF needs. However, it is important that the EMT executing the capital project also remain focussed on a near-seamless conversion of units and the LEMS from previous capabilities, to operational effectiveness with the new equipment and its new support system.

d. **System Engineering Management**. EMTs will execute various system engineering management processes, in replacing (acquiring), sustaining or improving their assigned equipment capabilities. These will include:

(1) management of hardware and software configurations;

(2) management of technical information and data sets;

(3) production of engineering statements of work and specifications, and engineering support to procurement activities;

(4) conduct and monitoring of technical investigations, tests and trials;

(5) collaboration with industry and allied forces in technical areas;

(6) engineering assistance and advice to EMT members and other LEMS staffs; and

(7) system engineering process improvement.

e. **Equipment Support Management**. EMTs will also execute various equipment support management activities and processes related to replacing, sustaining or improving their assigned capabilities. These will include:

(1) creation, sustainment, and improvement of an effective and integrated Logistics Support System;

(2) management of an effective identification and tracking system for assigned equipment and its associated support items;

(3) management and re-provisioning of support item inventories;

(4) technical and inventory management assistance and advice to EMT members, and other LEMS staffs; and

(5) equipment support management process improvement.

LEMS STRATEGIC TASKS

10. **Repair**. Strategic LEMS resources are focussed sustaining the fielded land equipment capabilities of the CF. This level holds most of the engineering resources, housed within the EMTs and industry. Using this expertise, and with a knowledge of the repair capabilities of the field units, LEMS strategic staffs:

a. Set the repair policies for all equipment. They manage the provisioning and distribution of repair support items including tools, tests equipment, manuals, etc.

b. Manage repair and overhaul programs.

c. Identify equipment-engineering weaknesses that merit improvement in either the equipment or in its support system. These deficiencies may be identified by special reports raised by LEMS units, or may come from information provided by allies or industry; or may be deduced through analysis of LEMS data produced by information systems. Sub-tasks performed in this area will include:

(1) analysis of equipment and equipment support system performance;

(2) development, testing and introduction of equipment modifications and product improvements;

(3) development, testing and introduction of equipment support system improvements; and

(4) analysis and improvement of EMT process quality and velocity.

11. **Recovery**. Recovery at the strategic level primarily involves:

a. testing and approving recovery equipment and procedures; and

b. coordinating interoperability with Allies through use of Allied Engineering Publication (AEP) 13 and AEP 17 and STANAG 2399 which provide information on recovery operations and equipment when working with allied nations.

12. **Repair Parts Management**. Repair parts management is particularly important at the strategic level. This task starts with the initial provisioning of repair parts and the production of an illustrated repair parts manual and scale. It carries on with the re-provisioning and redistribution of repair parts, scaling for specific missions using the initial scale and tailoring for actual usage data and mission profile. The task ends with determination of unsatisfactory performance or unavailability of the repair part and the identification and acquisition of suitable quantities of a replacement.

13. **Technical Training**. This task is primarily a strategic level task. Based on Occupation Specifications and Occupation Specialty Specifications; with the training in basic occupation, advanced occupation and occupation specialties conducted at CF schools. Introduction of new equipment is to be measured against the above specifications to determine whether it is introducing new technology not covered by previous training. This review is to be conducted

jointly between the EMT Staff, the J4 Eqpt staff (DLERM 4), the Occupation Advisor Staff and the affected CF school staff. The review will recommend to the appropriate managing authority whether changes to an existing specification is required and at what level, whether a new specification is required and/or identify any conversion training requirements.

14. **Equipment Inventory Management**. Management of equipment requirements, acquisition projects, fleet management and disposal are the primary activity of LEMS staff at the strategic level. Tasks performed at the strategic level in this area will normally be contained within a capital project, and will include:

a. analysis of options to address the equipment capability deficiency;

b. development and approval of a project plan;

c. development, testing and introduction of a new equipment;

d. development, testing and introduction of the equipment support system associated with the new equipment; and.

e. withdrawal and disposal or redistribution of replaced equipment and its associated support system items.

15. **Technical Information Management**. The strategic level is the focus for technical information management as follows:

a. **Product Data (PD)**. The EMTs will be the primary custodians of this information whether it was provided by the Original Equipment Manufacturer (OEM) or was generated by the In-Service Manager, in the EMT, for use by the operators and maintainers of the equipment. These include Operators Manuals, Maintenance Manuals and Illustrated Parts Manuals and Scales.

b. **In-Service Data (ISData)**. ISData is collected at unit level, managed at fleet level and made available

to all. The strategic level is responsible to provide a common reporting and feedback system for technical data. The importance of this task cannot be understated—the information management tools that collect and organise this data are of critical importance to all LEMS activity carried out at the strategic level. This data must continue to flow during wartime operations, and the tools must be provided forward into a theatre of operations if LEMS is to work on the battlefield.

16. **Technical Advice**. The EMTs represent the sole CF staff focussed on specific equipment capabilities, and as such, routinely provide fleet-specific advice to LEMS elements at all levels, to other staffs in DND and Government, to allies and to industry. They also act as a conduit for fleet-related information from these same sources. Beyond the EMTs, DGLEPM LEMS staffs provide overall LEMS policy and procedure direction, as well as acting as the LEMS staff in the NDHQ strategic level joint staff (J4 Eqpt). Tasks performed at the strategic level in this area will include:

a. act as LEMS staff within the National Joint Staff;

b. provide land equipment capability advice to CF and other interested parties;

c. co-ordinate the flow of land equipment capability advice between parties;

d. maintain an awareness of related industrial and allied force equipment capabilities;

e. develop and promulgate LEMS policy and procedures; and

f. support LEMS staffs in subordinate headquarters, which may include deployment of EMT elements into operational level staffs or LEMS units.

CHAPTER 3
LEMS AT THE OPERATIONAL LEVEL OF SUSTAINMENT

INTRODUCTION

1. The Continuum of Operations and Spectrum of Conflict[10] prescribes what military actions are necessary to achieve strategic aims and objectives. The modern battlefield has developed characteristics that highlight and reinforce the importance of land equipment management in achieving a successful campaign. Some of these characteristics and planning factors include:

a. **Rapid Operational Manoeuvre**. Dynamic forces will seek rapid and deep penetration to defeat enemy cohesion and will to continue the fight. This could be supported through feints and screening manoeuvres seeking to confuse the enemy. Multiple Lines of Communications may be required to support this manoeuvre or force-build up. These operations will produce a significant equipment support bill.

b. **High Tempo Operations**. Successful campaigns will require staff effort unlike any previous conflict. Continuous day/night operations, short decision cycles and the complex synchronisation of combat power require staff who can focus the limited LEMS resources on the commander's main effort. This staff analysis requires precise and timely equipment information.

c. **Freedom of Action**. It is expected that units and formations will seize opportunities in keeping with the commander's intentions. This requires a certain self-sufficiency of equipment support to achieve the tactical missions, of the Task Force. LEMS staff must plan for the equipment support needed for the

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[10] *Canada's Army* p.73

entire campaign, and be able to apportion it where it will be most effective. All forces need organic LEMS support, and modularity must be a design characteristic of LEMS support units to allow task tailoring of the support.

d. **Liaison**. Comprehensive liaison capability is required to achieve a robust level of support in a coalition/combined/joint operation.

e. **Shortages of Replacement Stocks**. Repair will be the dominant method of maintaining equipment levels necessary for operations due to the traditionally small CF operational stocks of vehicles and technical items. The increased lethality of the battlefield and the complexity of modern equipment complicate this. Therefore, LEMS staff must employ repair resources effectively, and inventive and flexible technicians are required to conduct battlefield repairs as a matter of course.

f. **Split-based Operations**. The unique repair requirements of high technology, the absence of deployable heavy repair units in the CF and the expected paucity of local civilian industrial facilities may require the CF to employ a split-based approach to operational level support. Canadian based CF units, industrial facilities and contractors are employed as repair agents vice attempting to conduct all repairs in-theatre. In-theatre employment of contractors in secure areas may be necessary to meet CF shortfalls in capability.

g. **Support to Staging Areas**. The movement of forces into theatre requires one or more staging areas where equipment and personnel are readied for battle, and combined formations trained. Operational level LEMS commanders and staffs must plan to meet these requirements with economy so as to preserve resources. They must ensure as well that LEMS unit training is not neglected, and that they be readied for war.

2. At the operational level the LEMS staff and units carry out tasks designed to maintain the equipment capability required to win the campaign. Managing theatre stocks of equipment and supporting the Land, Sea and Air Components of the Task Force does this. The term operational level can be applied to those staffs and units who support the environmental components, and they usually reside in the Theatre Logistic Base/Forward Logistic Bases/ Theatre Support Commands etc, but they will operate in the combat zone if required by the campaign.

3. Some consideration should be given to the mix of tasks carried out by units at "the operational level". While some contribute to winning campaigns, others are aimed at providing tactical support either to themselves or to the supported unit.

LEMS PROCESSES

4. Figure 3-1 reveals some of the LEMS processes and where they are carried out in the operational level staffs and units:

Element	Sub-element	Acquisition	R&D	Maintenance	Engineering Change	Plan	Advise	Inventory Control	Dispose
NCE Staff	J4 Eqpt	X		X	X	X	X	X	X
NSE Staff	MMC					X	X	X	X
NSE Unit	Supply Bn	X						X	X
NSE Unit	Maint Bn			X				X	X

Figure 3-1: LEMS Processes at the Operational Level

5. Equipment staff processes at this level include complex equipment management functions to sustain campaigns and major operations, which will likely be both combined and joint in nature. The planning and inventory control processes will be of vital importance.

LEMS TASKS

6. **Repair**. At the operational level LEMS units carry out extensive repairs in support of the commander's plan, largely in the support of theatre stocks and preparing formations for battle. They will be the focus of reconstitution operations after the battle is won. Resources are available to complete more comprehensive repairs and conduct component repair. These capabilities are generally available at the expense of repair unit mobility. The maintenance tasks at this level include:

a. Preventive maintenance on equipment arriving in-theatre, or in the CFSS stock. It includes these tasks:

(1) new equipment fielding trials;

(2) pre-issue inspection;

(3) inspection of supply stocks; and

(4) preservation/de-preservation.

b. CS corrective maintenance on force equipment for force units without a supporting CS LEMS organization.

c. GS corrective maintenance on force equipment, including supply system stocks.

d. Augmentation of formation maintenance units/elements.

e. Managing Host Nation Support (HNS) and contractor maintenance support.

f. Conducting most in-theatre modification programs including the engineering design and development of modifications.

g. Conducting Technical Inspections when required.

h. **Battlefield Damage Repair (BDR)**. At the operational level, staffs must gather BDR lessons learned and issue technical instructions to inform all levels of LEMS. It can be expected that the CF will require maximum BDR effort given our equipment inventories, but it is important to note that BDR will only go so far, and equipment will eventually require repair at a proper facility.

7. **Recovery**. Recovery is a key resource, one that can influence the success or failure of a campaign. There are never enough recovery resources to meet all tasks. It must be controlled in a manner that allows it to be brought to bear where needed, whether in support of operational manoeuvre or main effort or critical tactical operations such as river crossings etc. For this reason it is the operational level units which hold most of the theatre's recovery assets. Their recovery tasks include:

a. Battlefield recovery including:

(1) operational level route clearance, and

(2) re-enforcing maintenance units.

b. **Back-loading**. The heavy lowbeds and tank transporters of the NSE transportation unit will play a vital role in this task which includes:

(1) operation and clearance of assigned Back Loading Points (BLPs);

(2) clearance of assigned Equipment Collection Points (ECPs); and

(3) cross-loading between LEMS units.

8. **Repair Parts Management**. The provision of repair parts functions at the operational level as it does at lower levels. It is the staff or management role that is significantly different at the operational level. While the tactical level uses what parts it is given, the operational level determines what parts should be held where, which equipment groups should be managed and the level of rigor that should be applied to the management of those parts. The Critical Assemblies (CAs) must be identified, apportioned and managed closely. The criticality of the repair part is determined by such factors as the quantity available, expense or the nature of the equipment being supported. Other repair parts management considerations include:

a. **Scaling**. Scaling is largely done at the strategic level based on the standard groupings of units and formations, typical failure rates, and in accordance with the Permissive Repair Schedule (the PRS designate which types of repairs will be done by which types of LEMS units). At the operational level, LEMS staff tailor the scales to suit the real failure rates and any changes made to the PRS are aimed at improving support to the operation.

b. **Stocking**. While a scale is a pure analysis of what parts are likely required, stocking seeks to place the parts at the right location for a specific operation or campaigns. The approval of the responsible LEMS officer is required before changes to repair parts holdings are implemented. Factors considered include the enemy threat, commander's priorities for support, physical characteristics of the battlefield, quantity of parts available, etc. Supply personnel within the LEMS staff then design and implement the stocking plan.

c. **Control Mechanisms**. During operations it is of utmost importance that LEMS staff ensure the maximum benefits gained from available parts, and to accomplish this goal operational level LEMS staffs put various control mechanisms in place. These controls include the following actions:

(1) designate CAs for constant tracking;

(2) devising release or issue authorities and implementing an approval process for CAs; and

(3) identify critical stocking levels which when reached engage the release approval process.

d. **Reclamation, Salvage, Robbing and Cannibalization**. It is at the operational level that the policies for reclamation, salvage, robbing and cannibalization are established. It is done by the LEMS staff in conjunction with the operations staff to gain the maximum use from repairables. Considering each of these processes:

(1) **Reclamation**. The removal of repair parts from condemned equipment to be put into supply stocks, and the return to serviceable condition. Usually done at the operational level by GS maintenance organisations to increase the stocks of repair parts. It forms a significant part of the operational level replenishment process.

(2) **Robbing**. The controlled removal of parts from equipment to repair others, with intent to replace the removed part at a later date. Uncontrolled and indiscriminate robbing of major equipment, whether in operational use, undergoing maintenance or in storage, leads to an excessive workload for maintenance personnel, disrupts the replenishment system and raises the possibility of the robbed item not being replaced (hence cannibalizing). Generally, robbing is a tactical task, taking place at unit level in order to make a major equipment serviceable and/or acceptable to meet an operational requirement because the sustainment system could not provide

the needed item within the required timeframe.

(3) **Cannibalization**. Differs from robbing in that there is no intent to replace the part. Authority to cannibalize must be well defined by operational level staffs. Once authorized, the actual work is generally a tactical level task.

(4) **Salvage**. Defining what constitutes salvage is usually done at the operational level.

9. **Technical Training**. Many technicians in theatre may need further technical training. Reservists may need to be updated on equipment they have not seen in peacetime. All technicians may require cross training on allied equipment or new pieces of kit introduced to meet the CF's surging wartime equipment requirements. It is the operational level LEMS staffs that will co-ordinate this training. Maintenance units will implement it, though their resources for this task are quite limited. Technical training will require additional instructional resources from Canada (CF Schools and civilian contractors).

10. **Equipment Inventory Management**. It is at the operational level that inventory management for all theatre equipment is carried out, including the management of equipment stocks, and acquisition and disposal. These latter tasks occur at a reduced level as compared to the strategic level, and more so than at the tactical level:

a. **Acquisition**. In-theatre purchases of equipment will be done at the operational level if the requirement can't wait for support from Canada, or if it makes economic sense to do so. They will be made as per financial policies defined prior to deployment, and many contracts will need strategic approval prior to purchase.

b. **Disposal**. In-theatre disposal is conducted primarily at the operational level, in accordance with authorised limits. Disposal authorities usually balance the need to maximise the service life of

equipment, while ensuring obsolete equipment is not retained in unit lines. Disposal of war materiel is always a sensitive activity in a foreign country, and therefore most disposal activity takes place in Canada.

11. **Technical Information Management**. The operational level of the LEMS is the primary user of technical information, the tactical level generates rather than uses this information. It is the primary tool available to the LEMS staffs for making scaling, stocking and other resource management decisions as it provides equipment status reports, maintenance unit workload reports and failure data on vehicles and components. It is the conduit to the strategic and tactical technical authorities, and complements the chain of command rather than detracts from it. The operational LEMS staffs manage both Product Data, including the control of electronic databases and technical manuals and In Service Data, which is collected at unit level, managed at fleet level and made available to all.

12. **Technical Advice**. The provision of technical advice to commanders on matters affecting the operational capability of land technical equipment is the most important task carried out by LEMS staffs. Of the many considerations required to formulate a plan of battle, the **availability** of weapon systems is key. LEMS staff must be capable of analysing a plan of battle to determine battle and non-battle equipment losses to understand what equipment availability will be at the end of each phase of battle. This will allow the design of the maintenance support plan, and may suggest where operational pauses are required to repair and/or replace vehicles. The commander's selected course of action will certainly be based on equipment availability, and presenting the results of LEMS analysis in these terms will demonstrate how LEMS is a combat multiplier.

13. The glossary provides the various technical definitions of availability, but a more general view is shown in Figure 3-2.

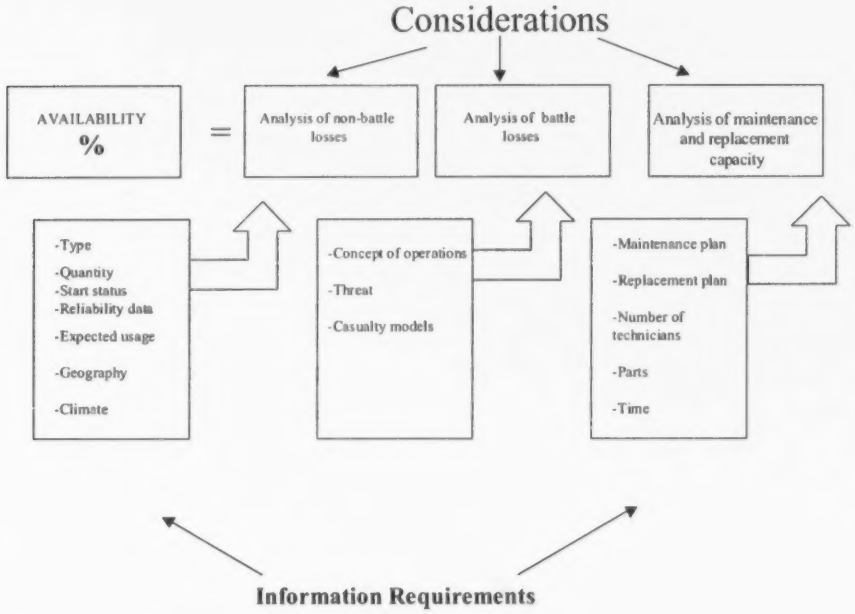

Figure 3-2: Definition of Availability

ORGANIZATIONS

14. **Organization of Maintenance Support on the Battlefield**. The Army strives to place sufficient equipment and maintenance resources within formed army units and formations to support their peacetime requirements and anticipated operational requirements. Commanders and their equipment staffs can modify this prior to commitment to battle in consideration of the following:

a. **Mission-Tailoring**. Maintenance units may organize for a specific function or mission through temporary regrouping of maintenance units or elements. For example, all Vehicle Repair Platoons from unit to the GS Maintenance Battalion could be organized to carry out preventive maintenance or modifications prior to an operation, though this is not normally the task of many of the platoons.

b. **Echeloned Support**. All units and formations have organic or are assigned maintenance support

elements designed to give them a designated level of self-sufficiency. This is the basis for EBB v2.1, the "start-state" for organizing support.

c. **Organize by Area**. LEMS organizations may be organized to support the units in a given area of operation (usually brigade (BSA), division (DSA), combined forces (CFSA) and corps (CRSA) support areas and force (FLB) and theatre (TLB) logistics bases). For example, a maintenance unit of a division could be tasked to support all non-division units operating in the DSA.

15. **Units**. The maintenance units have been discussed broadly in Chapter 1, and will be discussed in more detail in *CSS Units in Battle* B-GL-345-001/FP-001. All GS maintenance, supply, and transportation units contribute to LEMS at the operational level:

a. **GS Maintenance Units**. These units provide GS repair and recovery. GS maintenance units are semi-static, performing more complex corrective maintenance tasks with capabilities limited only by the amount of resources available to it.

b. **GS Supply Units**. These hold theatre stocks of repair parts and equipment, for issue to GS, CS, and sometimes unit level.

c. **GS Transportation Units**. Besides the distribution task these units hold the bulk of heavy lift. This includes lowbeds/tank transporters required for backloading tasks and also the heavy lift needed to move the semi-static GS maintenance and supply elements.

16. **Headquarters and Staffs**. There will be various headquarters involved in a combined operation. Some or all of the following headquarters may be combined depending on the size of the operation, but the functions performed will remain vital to the operations success:

a. **National Command Element (NCE)**. In a combined or coalition operation all Canadian troops will be under the command of this headquarters, though they will likely fight under an Allied Component Commander. The Canadian Contingent Commander will likely retain only command or control of administrative support, and the NCE LEMS staff will focus on operating the link to the strategic level of LEMS, planning support to operations, and linking to the Coalition HQs. The NCE HQ would have a major's position entitled J4 Eqpt and further staff as necessary and would be concerned with the equipment capability of the Contingent.

b. **National Support Element (NSE) Headquarters**. This headquarters will contribute to the campaign support plan, and will execute the plan as well. It will integrate its support capabilities with those of our allies seeking synergy where possible, through the Theatre Support Command HQ, Corps Support Command HQ or other responsible organisations. The NSE HQ would likely have a major/captain position entitled J3 Eqpt (concerned with provision of equipment support to the contingent) and a captain position entitled G4 Eqpt (concerned with the equipment capability of the NSE itself).

c. **Component/Formation Headquarters**. These headquarters exercise command and control at the tactical level, and design and fight the support battle. Component headquarters such as the Main Contingency Force Brigade HQ would have a captain position entitled G4 Eqpt who would be concerned with the equipment capability of their formation.

17. **Tasks of LEMS Staffs**. The equipment systems of the contingent provide the combat power on the modern battlefield. It is the J4/G4 Eqpt and his staff who manage this equipment. including vehicles, weapon systems, repairable unit, etc on behalf of the commander. The responsibilities include:

a. networking with other staffs, at the strategic, operational and tactical levels, Allied and Canadian, on all equipment related matters, particularly where common vehicle platforms are concerned;

b. co-ordinating the support from operational and strategic units in Canada;

c. contributing to the Operational Planning Process to ensure the feasibility and sustainability of the campaign design, which is vital to the commander's freedom of action;

d. co-ordinating fleet rotations with strategic LEMS staffs;

e. preparing equipment portions of contingent administrative plans, contingency plans, orders, instructions and directives;

f. establishing policies on behalf of the commander on equipment related matters including BDR policies;

g. establishing controls on equipment stocks, monitoring equipment inventories and authorizing issues of controlled equipment;

h. monitoring maintenance status of equipment and repair units;

i. repair parts management, including scaling and stocking of repair parts and technical items within the contingent;

j. technical training, including management of LEMS personnel qualifications and technical training requirements;

k. managing maintenance information and information systems; and

l. managing in-theatre equipment acquisitions.

18. **Equipment Group Managers**. Working for the J4 Eqpt, and located within the MMC, these staffs look after a designated group of equipment. The grouping can be made to suit the operation but the nominal groupings would be combat systems and non-combat systems. These groups may be staffed with functional experts, i.e. automotive, weapon and electronics. They manage and monitor equipment stocks and the repairable units/key components of the equipment. They are the focal point for material management/LEMS information systems. They have the following tasks in s' ρport of their equipment group:

a. track stock levels of critical equipment, repair parts and technical items within the theatre;

b. identify equipment for controls as usage and stocking levels dictate, and co-ordinate requests for the release of controlled equipment by relevant authority;

c. provide information support to the J4 Eqpt and other staffs; and

d. track usage and availability of maintenance resources.

LEMS INTERFACES AND LINKS

19. **Links to the Strategic Level**. The staffs of the operational headquarters are the focal point for the link back to Canada. This is the pre-imminent link:

a. to maintain the sustainment flow of equipment and repair parts;

b. to gain engineering advise and expertise;

c. to assist strategic planning; and

d. to conduct business with operational units with a split-base nature.

20. **Links to the Operational Level**. These provide the operational commander and other operational level staff with the information needed for operational planning and the conduct of successful operations:

a. Links to operational level GS unit commanders and staffs to understand status, capabilities and availability of resources.

b. Links to the sustainment engineering staffs and units who support the infrastructure and lines of communictions used by LEMS units. As well, this interface determines repair responsibilities for common equipment groups (electrical generating systems, water purification systems, etc.).

c. Links to the communication engineering staffs and units, who are customers of, and support providers to the LEMS.

d. Links to host nation/allies/coalition partners. Co-ordination of support from all allies will be necessary to provide war-winning support. LEMS liaison officer exchanges and information links will be established to facilitate this co-ordination.

21. **Links to the Tactical Level**. These provide the operational commander and the staff with feedback, and data–the information needed for operational planning:

a. Links to army formation staffs. It is essential that the functions and needs of the user are fully understood and considered. This is one of the reasons why members of the LEMS must have a comprehensive knowledge of army operations.

b. Links to other capability components in-theatre , air and maritime, as they also operate land equipment and require GS LEMS support.

LEMS IN OPERATIONS

22. This manual will cover some aspects of LEMS in operations. In some cases there is no comment to be made, as the LEMS is flexible enough to support the operation, or the level of detail is best placed in formation or unit SOPs and not in this manual. In other cases there are other doctrine manuals which cover all aspects of the operation including LEMS, thus this manual would be a duplication. Lastly, in some cases the question has yet to be considered, and thus the LEMS doctrine remains unwritten.

23. **Campaign Planning**. The manuals *Conduct of Land Operations-Operational Level Doctrine for the Canadian Army* (B-GL-300-001/FP-000) and *Land Force Tactical Doctrine* (B-GL-300-002/FP-000) outline how Canada's Army will fight and win campaigns. LEMS must support these campaigns, and operation-specific aspects of LEMS that should be considered.

24. **Battlefield Framework**. Within an Area of Operations, there are three closely related sets of activities which characterise operations:

a. **Deep Operations**. This is generally not carried out by the Canadian Army and no LEMS doctrine is required.

b. **Close Operations**. This is our tactical arena and is the basis for this doctrine manual.

c. **Rear Operations**. If a commander is too have freedom of action, then he must provide some measure of security for his rear area and the support units located therein. All CSS units must protect themselves though self and mutual defense, threat avoidance and dispersion. Rear Area Security Doctrine will be further amplified in CSS Units in Battle (TBI) and is currently found within formation and unit SOPs.

25. **Types of Operations**. This is a list of how Canada views various operations with some comment on the implications for LEMS:

a. **Operations Other than War (OOTW)**:

(1) **Peace Support Operations (PSO)**. This is the subject of Joint and Army publications to be issued, though no specific LEMS doctrine is likely required; and

(2) **Domestic Operations**. No specific LEMS doctrine is required.

b. **Operations of War**:

(1) **Offensive Operations**. LEMS doctrine is designed to maximise the combat power and momentum of the force. Offensive operations require:

(a) Equipment reserves are considered as part of the plan, and reapportioned as necessary.

(b) Resupply of repair parts forward via aviation will ensure responsive support to lead elements.

(c) Maintenance units must be mobile, responsive and provide forward support, maximising in-location repairs.

(d) LEMS resources may be reallocated increase a formation's or unit's freedom of action, augmenting the repair and recovery capability of lower levels EME elements as needed.

(e) Repair resources may be reorganized / re-roled to:

i. maximise preventive maintenance in the

preparatory phase, conducting detailed inspections of all equipment;

ii. concentrate corrective repair resources on priority units or equipment types;

iii. pre-authorized robbing, and cannibalization may reduce the down time and maximize equipment effectiveness for short duration operation.

(f) Recovery resources conduct route clearance and support obstacle crossings. ECPs must be utilized to concentrate casualties so that the follow-on LEMS units can quickly locate and initiate repairs.

(g) LEMS organizations must ready themselves to advance in support the offensive operation.

(2) **Defensive Operations**. The LEMS must be utilized to have the maximum amount of equipment ready prior to battle and return the maximum amount of equipment to a battleworthy state in the minimum amount of time:

(a) Equipment reserves are considered as part of the plan, and reapportioned as necessary.

(b) Increasing stocks of repair parts forward will ensure responsive support to lead elements, though they are placed at some risk of destruction. But moving supplies forward from the rear may be

more difficult due to enemy attacks along the lines of communication.

(c) LEMS support should be focussed forward to key defensive equipment. Just as non-essential formation/unit elements should be located rearward of the main defensive area, non-essential LEMS support should be sited rearward.

(d) Non-priority equipment is best.

(e) The backloading system must be used to guard against the destruction of the LEMS resources themselves, and clear collection points quickly.

(f) The support to the covering force, and its reconstitution must be planned for if it is to be available for future operations.

(g) Equipment inspections and non-critical modifications are curtailed.

(h) Recovery resources are given continuous route clearance tasks.

(i) Time restrictions on repair activities and repair priorities often change.

(j) Maintenance priority may be given to the blocking or counter attacking forces at the expense of other elements.

(3) **Delaying Operations**. It is fundamental that essential systems be repaired forward, while leaving the bulk of the LEMS units in the rear. Recovery should be prepared to react quickly to recover casualties to the rear. Again, pre-authorized robbing and cannibalization may be required to supplant the lack of LEMS units deployed near the front line.

(4) **Transitional Phases**. These link the three operations of war, but require no further LEMS doctrine:

(a) advance,

(b) meeting engagement,

(c) link-up,

(d) withdrawal, and

(e) relief of troops in combat.

c. **Unique Operations**:

(1) **Airborne Operations**. See B-GL-322-004/FP-001.

(2) **Amphibious Operations**. This requires no further LEMS doctrine.

(3) **Operations by Encircled Forces**. This requires no further LEMS doctrine.

(4) **Urban Operations**. This will be the subject of a future Army doctrine manual.

(5) **Reconstitution Operations**. This includes the repair/replacement of combat equipment, and the reconstitution of LEMS resources.

d. **Operations in Specific Environments**:

(1) **Mountains**. See B-GL-323-001/FP-001, but the primary implication to LEMS is that the terrain will increase strain on equipment with the resultant increase in failures.

(2) **Jungle**. See B-GL-323-002/FP-001, but there are few implications to LEMS.

(3) **Forests**. There is no doctrine required in the Army to cover this environment.

(4) **Arctic**. See B-GL-323-003/FP-001 Basic Cold Weather Training, and unit and formation SOPs.

(5) **Desert**. EME operations in the desert are generally influenced by the following factors:

(a) Distances to supported units are increased, and supported units may be difficult to locate when repair in location or recovery assistance is required.

(b) Passive air defence measures, such as the use of camouflage nets to hide vehicles and facilities and dispersion as a defensive measure, require an extensive effort.

(c) Holdings of certain repair parts, such as filters, bearings, and cooling system components, are increased.

(d) EME personnel have reduced productivity during the heat of the day. As much maintenance as possible is completed at night,

using blackout procedures when necessary.

(e) Requirements for assistance to supported units in the performance of operational maintenance generally increases.

(f) To the maximum extent possible, all maintenance operations are completed under or behind shelter of some kind to prevent entry of sand into the internal components of the equipment. During repairs in location a shelter or canvass barriers are constructed to provide some protection from blowing sand.

(g) Due to the increased mobility requirements of supported units, more emphasis on forward repair support is required.

(6) **NBC**. Two references apply, B-GG-005-004/AF-001 *Canadian Forces Operations Nuclear Biological and Chemical Defense*, and G-GS-316-014/FB-001 *Formation and Unit Procedures*. Further LEMS considerations will be made as these references are updated.

CHAPTER 4
LEMS AT THE TACTICAL LEVEL

INTRODUCTION

1. The nature of modern warfighting at the tactical level reinforces the importance of LEMS as an essential factor in achieving a successful mission or series of missions. Units and formations will have increased freedom of movement and action on a fluid battlefield and this will require self-sufficiency of LEMS support. There will be an increasing need for frequent re-grouping of units to achieve tactical surprise or to rapidly reinforce success. These characteristics will require modularity in the design of tactical level maintenance units to ensure support is tailored to the mission. At the tactical level, the LEMS is concerned mainly with restoring the capability of equipment through repairs and limited equipment replacement but also involves planning and co-ordinating the best use of its resources through work backloading or cross-loading. All equipment is segregated into priority and non-priority equipment based on the commander's priorities, which will identify those that are critical to the operation. Generally, priority equipment will include A vehicles (combat, reconnaissance and armoured engineer), essential B vehicles (command and communications) and major weapons systems.

2. **LEMS Elements**. At the tactical level, the elements or organizations which operate the LEMS are:

a. **LEMS Staff**. Planning and managing resources is the primary task of LEMS staff. They are found within all formation headquarters and above. Within units, the QM and Maintenance Officer fulfil this role for the Commanding Officer.

b. **Logistic Units**. The role of supply and transportation units is to operate the replenishment system. LEMS and replenishment are interdependent.

c. **Maintenance Units**. These units perform the maintenance function, including repair, recovery, inspection and testing, servicing, modification, etc.

They perform the support missions outlined in Chapter 1.

LEMS TASKS

3. **Repair**. The various repair organizations and the relationships are:

a. **Integral Level Maintenance Platoons**. Perform Level One repairs, supported by the unit supply platoon. At this level, the work focus is put on casualties that can be restored to operational capability within a short time (usually less than four hours). The work comprises operator maintenance, preventive maintenance, limited battle damage repair (BDR) and modifications. Most equipment corrective repairs are performed as far forward as the tactical situation will permit (A1 echelon) so that it can be returned to battle immediately. Preventive maintenance is usually conducted in the A2 echelon. Unit maintenance personnel make the initial diagnosis and establish the level at which the equipment should be repaired based on existing policy.

b. **CS Maintenance Companies**. Provide Level 2 repair to priority equipment that can be restored to operational capability within a day. The work is limited to BDR and corrective maintenance through major assembly replacement conducted by MRTs. If required, the CS maintenance unit will augment unit integral support resources.

c. **General Support**. GS maintenance units provide Level 2 repairs to the non-priority equipment, and Level 3 repairs to all equipment in theatre. As the major holder of repair resources it is responsible for providing support to units without organic support, and to reinforce other maintenance units that have a shortage of resources or an over-abundance of work. The rearward location of GS maintenance

organizations permits them to repair equipment in a workshop where more resources can be dedicated to production versus battlefield survivability.

d. **Battlefield Damage Repair (BDR)**. BDR is the domain of the tactical level maintenance units. The effectiveness of BDR depends largely on the experience and trade knowledge of the technician. It requires a thorough understanding of the design and operation of equipment to bypass the normal diagnostic and repair techniques and considerable experience to know what expedients may work in a particular situation.

e. **ECPs and Repair**. The next paragraph provides the doctrine for ECPs as part of the backloading process, but they can play a more direct role in accomplishing repairs. The ECPs are not just nodes in the recovery system, but are nodes in the LEMS, which are characteristically smaller than a company or platoon location and may have a fixed period of operation. They can be used as a repair site for unit and CS MRTs, should in-situ repairs be rendered difficult due to ground or threat. They can hold replacement equipment, or parts or whatever is deemed necessary to support the battle.

4. **Recovery**. Battle damage and equipment failure can produce a large number of casualties. The speed with which the LEMS can return this equipment to battle in serviceable condition has a direct influence on the outcome of the operation. Recovery includes:

a. **Battlefield Recovery**. This includes extrication, righting, towing to the unit maintenance platoon and special recovery tasks (route clearance, support to gap crossing, support to bridging, etc). It is the primary task for unit recovery vehicles and GS recovery elements. CS units conduct very little recovery, usually supporting only brigade units without organic recovery resources.

b. **Backloading**. This is the rearward movement of vehicle casualties to higher-level maintenance units. It is important to note that the backloading doctrine is designed to move equipment along the shortest route to the appropriate maintenance organization. The manner in which this is done is as follows:

(1) Vehicle casualties can accumulate due to limits in recovery and repair resources, or when a fluid battlefield causes an extended line of communication. The accumulation of this equipment in the unit or formation maintenance organization location is undesirable as it results in congestion and poses a security problem; therefore they are moved to an intermediate location. LEMS staff will order the supporting maintenance organization to establish either:

(a) an Equipment Collecting Point (ECP) where units can collect casualties; or

(b) a Back Loading Point (BLP) where GS maintenance units collect casualties requiring reward movement to other theatre repair facilities or return to Canada.

(2) ECPs are normally sited to the rear of the unit A2 echelons and may support all units or particular units. They can be used to collect A and B vehicles, or even minor equipment. They are sited by the formation G4 Eqpt, with advice from the maintenance company, which will establish and command the point. A senior NCO skilled in technical inspection, recovery and repair commands an ECP. It is the responsibility of the supported maintenance organization to move the equipment to the ECP based on the unit technician's assessment of the level

of repair required. The supporting maintenance organization is responsible to move the equipment rearward from the ECP (also referred to as "clearing the ECP") to the required maintenance organization. Both GS and CS maintenance units have the capability to establish ECPs, but it is the primary role of the GS unit. This is because the ECP is a static point that soon falls behind advancing forces and thus would be a drag acting on forward repair focussed CS elements. It is primarily designed to serve the GS repair elements, and therefore benefits from GS ownership[11]. The GS units will do so in support of non-brigade equipment and in support of the brigade, while the CS element will have a limited capability to support brigade equipment. Only the GS maintenance unit has the responsibility to the clear the ECP, i.e. move the casualty rearwards from the ECP.

(3) BLPs operate according to similar principles however they are GS owned and operated. The NSE G3 LEMS and the GS maintenance commander will site them wherever they best serve, usually near the MSR and the formation maintenance units

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[11] The issue is really about "ownership" —the ECP is the node between the brigade organic units and the GS support assigned to it. There is a view that the CS Maint Coy should command the ECP as it is "responsible" for all support given to the brigade. This doctrine proposes that improvements in information systems will allow the G4, CS maintenance commander and GS maintenance commander to share a common operating picture, such that ownership issues will dissolve into a meaningless turf war. It does presume that the G4 and G4 Eqpt are professionals and understand the support system—otherwise the CO of CS Svc Bn will be required to manage forward support, CS and GS, if the formation commander is to have the required comprehensive advice on support issues. In the end, command and control arrangements will be made to suit the commander's needs.

they support. The NSE will clear them with GS maintenance and transport resources.

5. **Repair Parts Management**:

a. **Scaling**. Scaling is not normally carried out at the tactical level, though the advice of formation LEMS staffs and maintenance commanders is important to the scaling plan.

b. **Stocking**. According to the stocking plan made at higher levels, stocks are held as follows:

(1) **Integral**. Units hold enough stock for 15 days.

(2) **CS Maintenance Units**. These hold repair parts for their own use. They hold approximately 15 days of supply (DOS) **but are limited by the lift available within the unit establishment and rely on the distribution system to deliver what they need promptly**. These levels must be assessed carefully, as the repair parts organization must be mobile and will require augmentation in vehicles and technicians if they are to increase their holdings of repair parts.

(3) **GS Maintenance Units Supporting the Division or Brigade Group**. These hold repair parts for their own use. They hold approximately 15 DOS **but are limited by the lift available within the unit establishment and rely on the distribution system to deliver what they need promptly**. Their mobility requirements are such that the repair parts will be held on wheels or at least in sea containers or on pallets which can be relocated easily.

(4) **CS and GS Supply Units Supporting the Division or Brigade Group**. CS supply organizations hold no repair parts. GS supply organizations hold up to 30 days of spares for the contingent, locating the parts forward or rearward depending on campaign requirements. All maintenance elements replenish their holdings through the replenishment point operated by the GS supply element.

c. **Control Mechanisms**. The tactical level LEMS staff operates the control mechanism process. They also may define their own control mechanism parameters if the theatre policies are not sufficient, i.e. if they consider a particular part a critical assembly then they may assign it Critical Assembly status.

d. **Reclamation, Salvage, Robbing and Cannibalization**:

(1) **Reclamation**. Not normally carried out at the tactical level.

(2) **Robbing**. The controlled removal of parts from equipment to repair others, with intent to replace the removed part at a later date. It will take place at the tactical level.

(3) **Cannibalization**. Differs from robbing in that there is no intent to replace the part. This is generally a tactical level task.

(4) **Salvage**. Gathering salvage is the task of all units on the battlefield, though the return of equipment to service (reclamation) is a task of the operational level.

6. **Technical Training**. There is a requirement that most technicians employed within the tactical level will have the requisite type and level of qualification. While some of this training will take

place in the rear, tactical maintenance units will be required to conduct training whenever possible. All LEMS staff and maintenance commanders are responsible to identify any deficiencies and arrange the training accordingly.

7. **Equipment Inventory Management**. The LEMS staff will ensure the equipment inventories of all units and the stocking units are adequate to the task. They must monitor holdings and manage the deficiencies as they arise.

8. **Technical Information Management**. The organizations of the tactical level of the LEMS are the primary generator of in service data and primary user of product data.

9. **Technical Advice**. Formation LEMS staff and maintenance commanders provide technical advice to their commanders and direction to their staffs on matters affecting the operational fitness of land technical equipment, again with a focus on availability as discussed in Chapter 3. LEMS Staff (G4 Eqpt) provides technical advice to their supported commander.

TECHNICAL AUTHORITIES

10. Within the tactical level the positions which are allocated technical authority are as follows:

a. **Formation G4 Eqpt**. This staff is responsible for establishing technical policies for the formation.

b. **Technical Inspectors (TIs)**. Technical inspectors are appointed within each unit, maintenance organization and supply organization.

11. Technical inspectors conduct:

a. **Inspection**. Physical inspection to discover faults/confirm serviceability.

b. **Classification**:

(1) **Identification**. This confirms an item's Nato-Stock-Number (NSN) or other identity codes. This is necessary to research further technical data from within national information systems, technical orders, etc.

(2) **Conditioning**. Placing a tag with the appropriate code on the item detailing the future processing of the item within LEMS. This could identify the appropriate repair facility, or assign it for disposal, etc.

12. **Condition Classification Codes**[12]. Technical inspectors use these codes for major equipment such as A, B, C casualties to identify which maintenance unit should conduct the repair (note they continue to use the condition codes for minor equipment and repairables as required by the CFSS):

a. S—serviceable. The equipment is available for immediate use.

b. I—requires maintenance by the maintenance platoon/element with the Integral Support mission.

c. C—requires maintenance by a CS maintenance organisation.

d. G—requires maintenance by a GS maintenance organisation.

(1) G1—Level 2 repair by GS maintenance organisation.

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[12] These have changed from X,Y,Z etc because of the introduction of the CS/GS structures. A "line" based classification system does not provide the clarity needed. The new system is based on the question "what maintenance unit do I send the casualty to?"

(2) G2—Level 3 repair by GS maintenance organisation.

e. D—requires maintenance by a depot organisation, or by contractor/original equipment manufacturer.

f. BER—beyond economical repair under current conditions. This will include items for which movement costs in terms of time and resources required would be excessive.

g. BR—beyond repair.

	I	C	G	D	BER	BR
N/S Starter	X					
A Vehicle - N/S Engine		X				
Accident Damage			X			
Rebuild Required				X		
Beyond Repair Expenditure Limit (REL)					X	
Catastrophic damage						X

Figure 4-1: Classification Code versus Selected Maintenance Faults

13. **Casualty Replacement Decisions**. At all levels, commanders/staffs can issue replacement items as they see fit within their authorised limits of materiel. These decisions must be managed properly so that no control is lost over the equipment, thus reducing potential battle-winning resources from being available. All formations would have standard operating procedures to detail exactly how the process works, but as doctrine the following principles apply:

a. **Ownership**. The equipment should remain on unit charge if it is accompanied by its crew to the repair facility. For example, unit and CS repairs are done and the equipment is returned to the operator when

completed, having never left the charge of the unit. Depending on the nature of the GS repair, the same can be true (G1 repair, such as a Level 2 repair to a CMBG B vehicle by the NSE forward GS element). Where the casualty must enter the supply system as a repairable stock, or requires disposal, then the equipment must be removed from unit charge and the replacement process initiated.

b. **Vehicle Replacement Authorisation**. Under normal circumstances:

(1) A TI anywhere on the battlefield classifies the repair. If it is classified as G2, D, BER or BR the unit is informed.

(2) The unit demands a replacement though the formation G4 Eqpt. The issue of a replacement may be carried out if stocks are available within the formation holdings.

(3) If formation resources can't meet the demand, it will be relayed back to the appropriate level, where the demand is approved or rejected.

c. **Repairable Line Items** (B Class Components):

(1) All integral, CS, and GS maintenance facilities can replace the item from local supply accounts.

(2) The supply accounts will order replacements through the supply system.

(3) Repair of these items is generally done at GS or depot repair levels, after being back loaded. On completion of the maintenance activity the equipment is turned over to the operational or depot level supply unit for stocking.

LEMS EQUIPMENT REQUIREMENTS

14. This doctrine requires a suite of equipment, each carefully designed to perform its function and integrated to operate as a system. The Canadian army was well served by the MLVW, M113, and Leopard-based fleet of support vehicles. As those families of vehicles retire and new fleets arrive, the equipment support system must be modernised as well.

15. Predictive maintenance technologies are on the horizon. The capability for equipment components to monitor their own wear and predict failure will reduce the need for inspections and provide a more accurate method of determining overhaul schedules. This should reduce the stocking levels for repair parts and trigger just-in-time deliveries.

16. Information technologies will allow better management of LEMS resources through:

a. **Command and control information systems** (C2IS). The LEMS units require C2IS commensurate with the units they support. This will enable them to partake in the operational planning process, receive more timely orders, and have a more complete picture of the battlefield, due to better situational awareness. This will reduce time lost to navigational errors, and improve response time.

b. **Equipment management information systems**. These IS systems will facilitate the management of equipment stocks and maintenance resources, through Total Asset Visibility (TAV) and in-transit asset tracking.

17. The battlefield transportation systems of most countries are moving to larger capacity logistic vehicles that move sea containers (SC). These maximise the lift capability and reduce inter-modal handling. The implications are:

a. These vehicles will in turn require support variants for repair and recovery.

b. Twenty foot ISO sea containers should be used for offices, shelters and repair facilities particularly for NCE/NSE units. This units will then be able to share prime movers or reallocate them in accordance with mobility requirements.

c. The segment of MLVW Specially Equipped Vehicle shelters that currently support level 2 repairs should move to a sea container platform. Some shelters could be combined to make use of the increased space.

d. A new family of shelters are required:

(1) a CS tool crib;

(2) a GS tool crib;

(3) a power-pack test bed;

(4) a power-pack building/breaking SC;

(5) a vehicle repair facility package, including shelter, power, etc; and

(6) a battery support SC, in support of the increasing number of battery powered equipment found within units.

e. Support equipment EMTs should be responsible for the SC (and not the vehicle family manager as was done with the MLVW).

18. New fighting vehicles require purpose built support variants:

a. Armoured vehicles must be supported by armoured MRTs and armoured recovery vehicles to provide necessary mobility and protection if forward support is to be provided.

b. The on board cranes of these support vehicles must be sufficient to lift the turrets and power-packs of the supported vehicle.

c. These support vehicles require C2IS, navigational aides, and equipment management IS stations.

d. The wheeled nature of the LAV III requires a new suite of tire changing equipment.

19. The above suggestions are under consideration by DLR and some are already in service.

GLOSSARY OF LAND EQUIPMENT MANAGEMENT SYSTEM

1. This annex is provided to standardise terms in general use throughout the Land Equipment Management System. Note that not all these terms have been approved and published within the CF terminology publications and databanks.

2. The terms listed in this instruction are for the guidance of land equipment managers. The list is presented to avoid misunderstanding and data reporting errors within the Land Maintenance System.

3. Additional definitions may be found in the publications listed below. For ease of use, a number of definitions fro[illegible]se publications relating to land maintenance have been included in this glossary. They are identified by the abbreviations shown below, to indicate their source.

a. AAP-6 (A-AD-121-MP/JX-001) *NATO Glossary of Terms and Definitions (NATO)*;

b. A-LM-181-001/JS-001 *Standard Supply Instructions*, Chapter 1, Annex A (SSI); and

c. Termium website (AV)

GLOSSARY

(BOLD DENOTES NEW TERM)

"A" Vehicles	A vehicle group that includes all armoured vehicles.
accessibility/accessibilité	A measure of the relative ease of admission to the various areas of an item. (DGLEPM)

accessory equipment/équipement auxiliaire	Any non-expendable item of equipment which has been fixed to a vehicle or piece of equipment, but which may be severed or removed without impairing the item removed or affecting the basic function of the object to which it was fastened. (DGLEPM)
active time/durée d'utilisation	That element of lifetime during which an item is in the operational inventory)(DGLEPM)
adjustment/mise au point	Regulation of an item as necessary to maintain a required level of operational performance. (DGLEPM)
administrative delay time/délai administratif	Those elements of delay time that are not included in supply delay time. (DGLEPM)
alert time/période d'alerte	That element of uptime during which an item is thought to be in specified operating condition and is awaiting a command to perform its intended mission. (DGLEPM)
ancillary (equipment)/auxiliaire (équipement)	That equipment which is supplementary to the essential equipment making up the end item. (DGLEPM)
ancillary (maintenance organization)/auxiliaire (organisation de maintenance)	That element of a maintenance organization that handles equipment not otherwise assigned to discrete maintenance functions. (DGLEPM)
assembly/ensemble	A number of parts or sub-assemblies or any combination thereof joined together to perform a specified function. (SSI) An item forming a portion of an equipment, that can be provisioned and replaced as an entity and which normally incorporates replaceable parts or groups

of parts. (NATO)

attachment/dispositif auxiliaire

A part, sub-assembly or assembly designed for use in conjunction with another assembly or a unit or set, contributing to the effectiveness thereof by extending or varying the basic function of the assembly, unit or set. (DGLEPM)

availability/disponibilité

The probability that a system or equipment is able to operate satisfactorily at any given time. Although several types of availability have been defined, three key definitions are as follows:

a. Inherent Availability (IA) / disponibilité inhérente (DI)

IA = MTBF (Mean Time Between Failures)

MTBF + MTTR (Mean Time To Repair)

MTTR consists of active repair time only.

IA is therefore a characteristic of the equipment being maintained and does not reflect on the maintenance organisation. (DGLEPM)

b. Achieved Availability (AA) / disponibilité atteinte (DA)

AA = MTBM (Mean Time Between Maintenance)

MTBM + MDT (Mean Down Time)

MTBM and MDT only include preventive and corrective maintenance

	activities. This measure reflects the reliability and maintainability of the equipment.(DGLEPM) c. Operational Availability (OA) / disponibilité opérationnelle (DO) $OA = \frac{\text{Uptime}}{\text{Uptime + Down time}}$ Downtime consists of active preventive and corrective servicing and repair time plus time awaiting parts or labour and administrative delays. OA reflects on the maintenance environment as well as the equipment. (DGLEPM)
"B" Vehicles/ véhicules B	A vehicle grouping that includes all non-armoured vehicles.
backloading/envoi à l'arrière	The rearward evacuation of equipment casualties within a logistics system. (DGLEPM)
backloading point (BLP)/point d'envoi a l'arrière (PEVAR)	A location, at which equipment casualties requiring repair at a higher formation, are collected before being moved to the rear. (AV)
backlog/arrière	An accumulation of work in excess of available working capacity. (SSI)
battlefield damage repair (BDR)/réparations sur le champ de bataille (RCB)	The use of repair expedients of a temporary nature to repair equipment disabled on the battlefield, including damage caused by enemy action, normal failures and accidents. (DGLEPM)

battlefield clearance/évacuation du champ de bataille	The systematic use of centralized recovery resources to extricate and evacuate vehicles and other major equipment disabled during combat and abandoned by units. The prime purpose is to salvage useable materiel. (DGLEPM)
beyond repair (BR)/non reparable (NR)	A condition classification level that is self evident in that it cannot be fixed. (AV)
beyond economical repair (BER)/ réparation non rentable (RNR)	A condition classification assigned to an unserviceable item that, as the result of the application of financial criteria, is considered uneconomical to repair. (AV)
beyond local repair (BLR)/non réparable sur place (NRSP)	A condition classification assigned to equipment, which cannot be repaired at a given level of maintenance with its own resources. (AV)
breadboard model/maquette de montage	Initial hardware of open layout produced in the development of electronic equipment, which is used for technical feasibility studies. (DGLEPM)
"C" Vehicles/ véhicules C	A vehicle grouping that includes all non-armoured engineer support vehicles.
calibration/calibrage	Comparison between two instruments or measuring devices (one of which is a standard of known accuracy traceable to national standards) to detect, correlate, report or eliminate by adjustment any discrepancy in accuracy of the instrument or measuring device being compared to the standard. (CFTV)

Canadian Forces Registration Number (CFR number)/(numéro de) matriculation des Forces canadiennes (NMFC)	A seven digit number assigned to a specific equipment in order that it may be individually controlled by NDHQ. The first two digits indicate the year of manufacture of the equipment and the last five digits, which are not duplicated, act as a registration number for the specific registered equipment. (DGLEPM)
cannibalization (controlled cannibalization)/ cannabilisation (cannabilisation contrôlée)	The controlled removal, without intent to replace, of serviceable parts from an equipment as an alternative means of supply. (AV)
casualty/équipement endommagé	See equipment casualty.
check/vérification	To look at an item to determine only the correctness or accuracy of a specified condition. (DGLEPM)
checkout time/temps de vérification	That element of maintenance time during which the performance of an item is established as being in compliance with its specified ability . (DGLEPM)
Close Support (CS)	The *intimate* (which requires the element to have a high level of mobility) support provided to a formation to deal with tasks of immediate concern to his operations.
combat equipment/équipement de combat	Equipment that is designed to meet a specific military operational requirement. (DGLEPM)
commercial equipment/équipement commercial	Equipment available on the open market which has not been specifically designed or modified for military purposes. (DGLEPM)

component/composant

A part or combination of parts, having a specified function, which can only be installed or replaced as a whole, and is also generally expendable. (NATO)

An item contributing to the composition of a larger item. (DGLEPM)

component life/durée de vie d'un composant

The period of acceptable usage after which the likelihood of failure sharply increases and before which the components may be replaced in the interests of reliability of operation. (DGLEPM)

condemnation/réforme

The act of classifying materiel as beyond repair or beyond economical repair (materiel declared beyond economical repair is provisionally condemned pending approval by the authorizing headquarters). (AV)

condition classification/code d'état de marche

An alpha-numeric code used to classify equipment condition after EME inspection. Codes are as follows:

S—serviceable. The equipment is available for immediate use;

I—requires maintenance by the maintenance platoon/element with the Integral Support mission;

C—requires maintenance by a CS maintenance organisation;

G—requires maintenance by a GS maintenance organisation:

G1—Level 2 repair by GS maintenance organisation

G2—Level 3 repair by GS maintenance organisation;

D—requires maintenance by a Depot

	organisation; BER—beyond economical repair according to expenditure limits; and BR—beyond repair.
controlled cannibalization/ cannibalisation contrôlée	See cannibalization.
controlled stores/matériel contrôlé	Materiel which, because of its operational significance, can only be released by G3 staff. (AV)
conversion/conversion	The adaption or modification of an equipment or system from one operational function to another. (DGLEPM)
corrective maintenance/maintenance corrective	Maintenance actions carried out to restore a defective item to a specified condition. (NATO)
corrective maintenance time/temps de maintenance corrective	That element of maintenance time during which corrective maintenance is performed. This includes fault diagnosis time, fault correction time and fault proving time. (DGLEPM)
critical item/article critique	An essential item that is in short supply or expected to be in short supply for an extended period. (SSI)
crock/ vieux clou	See equipment casualty.
cross-loading/répartition de la charge de travail	The transfer of materiel requiring maintenance between equivalent maintenance units to redistribute workload. (AV)
defect/défaut	An imperfection, fault or error in manufactured materiel. (DGLEPM)

delay time/délai	That element of downtime during which no maintenance is being accomplished on the item because of either supply delay or administrative delay . (DGLEPM)
demand/commande	An authoritative request by an organizational element for an item of supply. (SSI)
depot level inspection and repair (DLIR)/inspection et réparation au niveau de l'atelier (IRNA)	A type of repair and overhaul (R&O) project involving level three maintenance tasks, normally conducted at a fourth line maintenance organization, carried out at predicted intervals in the life of an equipment system in order to minimize operating and maintenance (O&M) costs and/or extend the life of that system. Tasks may include stripping, inspection, refurbishing, replacing, or rebuilding those assemblies and components that do not meet DND specifications or have life expired. (DGLEPM)
depreservation/ dépréservation	The removal of materials or packaging used to preserve equipment against deterioration or corrosion during storage. (DGLEPM)
design authority/instance de conception	The office within DND responsible for designing or the approval of the design or changes thereto of a specific item of defence materiel. (LCMSGM)
Direct Support (DS)	A US Army term: "a mission given to supply, services, transportation, and maintenance units that normally provide support directly to other specific units. This allows the direct support unit to respond directly to the supported unit's requests for assistance or supplies".

downtime/temps d' immobilisation	That element of active time during which the item is not in condition to perform its intended function. This includes maintenance time and delay time. (DGLEPM)
Electrical and Mechanical Engineering (EME)/Génie électrique et mécanique (GEM)	The application of organized engineering and maintenance skills and techniques in the effective and economical design, development, testing, introduction, inspection, repair, modification, rebuilding and disposal of land vehicular and weapon systems and technical support equipment of the Canadian Forces. (DGLEPM)
Electrical and Mechanical Engineering (EME) Branch/Branche du Genie électrique et mécanique (GEM)	That personnel grouping of the Canadian Forces authorized to include officers of the Land Electrical and Mechanical Engineering (EME) MOC 43 classification and non-commissioned members of the Vehicle Technician MOC 411, Weapons Technician (Land) MOC 421, Fire Control Systems Technician (Land) MOC 430 series and Materials Technician MOC 441 occupations. (DGLEPM)
embedded computer/ système informatique intégré	A computer installed in and forming an integral part of an electronic or electro-mechanical system or sub-system. (LCMSGM)
equipment/équipement	A combination of parts, sub-assemblies and assemblies forming a unit which performs a complete function. (DGLEPM) All non-expendable items needed to outfit/equip an individual or organiation. (NATO)

equipment casualty/équipement hors service	Equipment lost to a military organization by reason of having been demolished or damaged so that it cannot perform its function until recovered and/or repaired. (DGLEPM)
equipment casualty park/parc d'équipements hors service	The area in a maintenance facility allotted for equipment casualties awaiting repair. (DGLEPM)
equipment configuration code (ECC)/code de configuration du matériel (CCM)	A six digit numerical code, created for use in identifying selected equipment, in order to facilitate the recording of their authorized entitlements and assets. (DGLEPM)
equipment failure/défaillance de l'équipement	An event which results in the inability of an equipment to perform its intended function. (DGLEPM)
equipment collecting point (ECP)/point de rassemblement de l'équipement (PRE)	A location at which materiel requiring repair beyond first line repair capability or capacity is collected for evacuation. (AV)
equipment maintenance code (EMC)/code de maintenance du matériel (CMM)	A three-character alpha-numeric code used for maintenance management data processing to identify: an individual type of equipment, group of similar equipments, or maintenance activity. (DGLEPM)
equipment management / gestion du matériel	Equipment management is the process by which the equipment is planned for, acquired, fielded, maintained and disposed of.

equipment registration number (ERN)/numéro matricule du matériel (NMM)	An ERN is assigned to CF equipment as an identifier for publications, drawings and specifications. It is part of the National Defence Index of Documentation (NDID) system and is composed of eight characters, which constitute code fields two, three and four of the equipment CFT0 number. (DGLEPM)
equipment support list (ESL)/liste justificative du matériel (LJM)	A means of supplying the user with equipment support details and a Provisioning Parts Breakdown (PPB) of equipment components. A means of identifying components by reference number or NAT0 stock numbered items selected in support of a specific equipment. (LCMSGM)
evacuation/évacuation	The movement of equipment casualties within a logistic system. (NAT0)
examine/examiner	To look critically at an item in detail to determine overall action. (DGLEPM)
experimental model/modèle expérimental	A model of the complete equipment to demonstrate the technical soundness of the basic idea. This model need not have the required final form or necessarily contain parts of the final design. (DGLEPM)
fail-safe/securité intégrée	Item design such that on failure of a specified nature in the primary operating mode, the item reverts to an alternate, but still effective operating mode. (DGLEPM)
failure/défaillance	The inability of an item to perform within previously specified limits. (DGLEPM)

failure rate/fréquence des défaillances	The number of failures of an item per unit measure of life, expressed in percentage of time, cycles, kilometres, events, etc, as applicable to the item. (DGLEPM)
fault correction time/temps de rectification des défectuosités	That element of corrective maintenance time during which actions are performed on an item to correct a fault . (DGLEPM)
fault diagnosis time/temps de diagnostic des défectuosités	That element of corrective maintenance time during which testing and analysis are performed on an item to isolate a fault . (DGLEPM)
fire control system (FCS)/système de conduite du tir (SCT)	A group of interrelated fire control equipments and/or instruments designed for use with a weapon or group of weapons. (DGLEPM)
fault proving time/temps d'épreuve	That element of corrective maintenance time during which an item is tested to prove that the fault has been corrected and that the item performs its intended function (DGLEPM)
firmware/ microprogramme	A computer program or instruction used so often that it is stored in a read-only memory (ROM) instead of being included in the software. (DGLEPM)

General Support (GS)/ soutien général (SG)	This is support provided to the force as a whole and not to any particular sub-division there-of. The US defines general support as a mission given to supply, services, transportation and maintenance units that normally provide support to DS units and other GS Units – they are found in echelons above division. The UK defines it as that CSS activity carried out to a greater depth where security is needed to generate work which is ultimately to benefit the fighting formation supported. They have GS companies above brigade.
hard standing/aire en dur	Ground which can support the weight of heavy vehicles. It precludes swampy, marshy or boggy areas in which vehicles would likely sink. Hard standing is a prerequisite for siting of a maintenance organization in the field. (DGLEPM)
help-yourself-park/parc libre-service	An area where derelict equipment not worth evacuation is dumped and is available for stripping by all comers. (DGLEPM)
human engineering/ergonomie	The area of human factors which applies scientific knowledge to the design of items to achieve man-machine integration and utilization. (DGLEPM)
human factors/facteurs humains	This term covers human characteristics. It includes principles and applications of human engineering, personnel selection, training, life support, job performance aids and human performance evaluation. (DGLEPM)

inactive time/temps inactif	That element of lifetime during which an item is not in the operational inventory. This includes time in storage or in repairable reserve. (DGLEPM)
inspection/inspection	The part of maintenance which consists of a series of physical checks and functional tests on an item or equipment. (DGLEPM)
inspect and repair as necessary (IRAN)/inspection and reparation si necessaire (IRSN)	See "inspect and repair only as necessary".
inspect and repair only as necessary (IROAN)/inspection et reparation si necessaire seulement (IRSNS)	A maintenance action normally conducted at a fourth line maintenance organization in order to minimize O&M costs and/or extend the life of a system. Tasks may include stripping, inspection, refurbishing, replacing, or rebuilding those assemblies and components that do not meet DND specifications or have life expired. Also see depot level inspection and repair. (DGLEPM)
In-Service Data (ISData)/ données de vie utile	ISData is the technical information built up by the operators, maintainers and managers of the equipment during its in-service life. It will consist of owner/location, configuration, reliability, availability and maintenance histories. This information is critical to the Engineering Change (EC) process, mid-life spares scaling and eventual replacement programmes. It should be collected at unit level, managed at fleet level and made available to all.

Integral Support/ soutien interne	The *immediate* (therefore organic to the unit) support provided to a unit to deal with tasks of immediate concern to his operations.
item/article	A uniquely identified object adopted for use. An item may form part of another item. (DGLEPM)
Land Equipment Management System (LEMS)/ système de gestion de l'équipement terrestre (SGET)	An organised set of policies, doctrine, procedures and resources formed with the aim of ensuring the operational fitness of the equipment of the army and of the land technical equipment of all the elements of the Canadian Forces for which the system has been assigned a specific responsibility. It is a fully integrated, co-ordinated and self-sufficient system that encompasses the entire spectrum of equipment management and is designed to support from the factory right through to the front lines.
level of maintenance/niveau de maintenance.	The level of maintenance is a measure of the maintenance/ engineering content and time required performing a task: a. Level One. Level one includes preventive maintenance and servicing, preliminary diagnosis of faults and corrective maintenance tasks of a minor nature. The term "Minor nature" infers short duration (less than three hours), and relatively simple repairs; b. Level Two. Level two includes corrective maintenance by repair or replacement of parts and assemblies, limited only by time (this limit is campaign dependent, but usually is

limited to 24 hours);

c. Level Three. Level three is responsible for corrective maintenance of longer duration than level two, reconditioning of assemblies, rebuild of minor components, limited calibration, reclamation and limited manufacture; and

d. Level Four. Level four is responsible for the complete overhaul of equipment. This includes complete fabrication or manufacture to design specifications, retrofit, mid-life improvements, and likely a production line capability. It is a permanent facility normally outside a theatre of operations, either 202 Workshop Depot or civilian manufacturer.

level of recovery/niveau de récupération

A classification of recovery tasks based on the extent of the tasks performed. There are two levels of recovery:

Level One. The extrication of an equipment casualty and its removal to a place where it can be repaired or to an ECP.

Level Two. The evacuation of an equipment casualty from a unit location or ECP to a maintenance organization where it can be repaired. This level includes taskings related to cross-loading, route clearance, obstacle duties, battlefield clearance and evacuation between backloading points (BLPs). (DGLEPM)

life cycle/cycle de vie	Sequence of events comprising selection or conception, design and specification development, purchasing, manufacturing, delivery, warehousing, maintenance, repair and overhaul, use and disposal of equipment or a system. (CFTV/DPMS)
life cycle management/gestion du cycle de vie	The management of all activities required to acquire and support materiel from the decision to procure to the time of its disposal from the Canadian Forces inventory. (CFTV/DPMS)
life extension/prolongation de la durée de vie	Activities required to prolong the in-service phase of operational equipment beyond planned or economic life expectancy. (DGLEPM)
lifetime/durée de vie	The time interval from acquisition or acceptance of an item to its disposal from the inventory . (DGLEPM)
lines of support/ligne	In land operations, the echelon at which a combat service support function is performed. "First line" is the support echelon organic to the unit; "second line" is the support echelon organic to brigade and division, "third line" is the support echelon organic to corps and NSE, and "fourth line" is national support base. (Non-approved)
logistics/logistique	The science of planning and carrying out the movement and maintenance of forces. As it relates to maintenance, it is those aspects of military operations, which deal with design and development, acquisition, storage, movement, distribution, maintenance, evacuation and disposition of materiel. (NATO)

maintainability /maintenabilité	The ability of an item, under stated conditions of use, to be retained in or restored to a state in which it can perform its required functions, when maintenance is performed under stated conditions using prescribed procedures and resources. (AV)
maintenance/maintenance	All actions taken to keep materiel in or to restore it to specified conditions. It includes: recovery, inspection, testing, servicing, classification as to serviceability, repair, modification, rebuilding and reclamation. (NATO)
maintenance authority/instance de maintenance	The office within DND responsible for developing the maintenance policy, defining the maintenance concept and approving the detailed technical instructions for a specific item of defence materiel. (LCMSGM)
maintenance depot/dépôt d'ateliers	A fourth-line maintenance facility organised to provide services beyond the capability of static bases and field maintenance organisations. (DGLEPM)
maintenance engineering/génie de la maintenance	The recognition of technical deficiencies in equipment and their investigation including: the cost effectiveness analysis of possible changes to support decisions on courses of action; the prototyping and testing of modifications; the gathering of parts and drawings; the amendment of technical manuals; the promulgation of instructions for embodying equipment modifications at user units and the monitoring of modification effectiveness in the field. (DGLEPM)

maintenance facility/installations de maintenance	The accommodation, including utilities and special provisions, required for the performance of maintenance. (DGLEPM)
maintenance support equipment/équipement de soutien de maintenance	Those items of materiel specifically required for the performance of maintenance. (DGLEPM)
maintenance time/temps de maintenance	That element of downtime during which maintenance is being accomplished . (DGLEPM)
major project/projet majeur	A stand-alone acquisition activity with costs more than the ceilings given for a minor project ($3M for equipment projects, $1 M for all others). (DPMS)
major crown project/grand projet de l'État	A project is deemed to be a Major Crown Project (MCP) when its estimated cost will exceed $100M and the Treasury Board would assess the project as high risk. If the Department considers that a project exceeding $100M would be better managed outside the full Major Crown Project regime, the appropriate exemption is to be obtained from Treasury Board. **NOTE**: The Treasury Board reserves the right to require any project exceeding the sponsoring department's delegated authority to be managed as a Major Crown Project. (DPMS)
master repair agreement (MRA)/accord - type de réparation	A standing offer (blanket) agreement covering repair of specified items on an "as and when" required basis, generally re-negotiated yearly. (DGLEPM)

material/matériau

A substance, either raw or manufactured, from which something is made, such as metal, synthetic rubber, leather, chemical, wood, fabric, adhesive, etc. (DGLEPM)

materiel/matériel

All moveable public property, excepting money, obtained by a department for issue on demand, or for sale to its administrative and operating units, to other departments, or to the public. Materiel includes manufactured equipment, supplies and raw materials. (SSI)

matrix management/gestion matricielle

A process where specialists work as project team members under a Project Director/ Project Manager, but remain responsible to their functional organization. (LCMSGM)

minor project/projet mineur

A project for the procurement, construction or development of equipment, material, and/or services for which: the capital and /or non-recurring personnel, operations and maintenance cost is less than the ceilings listed below; where there are no changes in force structure, i.e., all personnel requirements will be met within the resources available to the Capability Component and where recurring personnel, operations and maintenance costs will not exceed the ceiling listed below over a five year period.

Minor Project Ceilings:

(1) Equipment projects (except ADP)	$3M
(2) ADP projects	$1 M

	(3) Construction	$1 M
	(4) Research and Development	$1M
	(5) Personnel, Operations and Maintenance (PO&M)	$1 M
	(6) Recurring PO&M over a consecutive five year period. (DPMS)	$1 M

mission time/temps de mission	That element of uptime during which the item is performing its designated mission. (DGLEPM)
mobile repair team (or party)/équipe mobile de reparation	A group of technical personnel provided to perform a specified maintenance task or supplement a maintenance organization. (DGLEPM)
mock-up/maquette	A model built to scale, of a machine, apparatus or weapon. It is used in studying the construction of, and in testing a new development, or in teaching personnel how to operate the actual machine, apparatus or weapon.
modification/modification	For equipment, an engineered alteration to an item of supply that changes the design characteristics or capabilities of the end item, major assembly or sub-assembly component, part or accessory, and generally generates changes to related records. Normally, a modification is made after an item is delivered whereas a design change is made prior to delivery during production. (CFTV)
modification time/temps de modification	That element of downtime during which the item is undergoing modification . (DGLEPM)

modularization/ modularisation	The technique of designing equipment in such a way that faulty or unserviceable modules (unit assemblies) may be readily replaced by serviceable modules. (DGLEPM)
module (unit assembly)/module (ensemble d'unités)	A functional and structural assembly or sub-assembly so designed that if it becomes unserviceable it may be easily replaced (e.g. plug-in method) by a serviceable unit. (DGLEPM)
obsolete/déclassé	The status of an item which is no longer suitable for use. (DGLEPM)
operational (TBI)	This term is in the process of definition
operational effectiveness/efficacité opérationnelle	The probability that a system can meet an operational requirement successfully for a given time when operated under specified conditions. (DGLEPM)
operational readiness/état de préparation opérationnel	The capability (state of preparedness) of a unit/formation, ship or aircraft, weapon system or equipment to perform the missions or functions for which it is organized or designed. May be used in a general sense or to express a level or degree of readiness. (NATO)
overhaul/révision	The restoration of an item to its original performance/near life expectancy. It includes the replacement of worn, damaged or life-expired parts and parts whose service life is about to expire, the incorporation of approved modifications, and the restoration of components as necessary. The depth of work will normally be to manufacturer's standards using replacement parts produced by the original equipment manufacturer or equivalent quality. (SSI)

part/pièce	One, two or more pieces joined together, which are not normally subjected to disassembly without destruction of designated use. (SSI)
performance standard/norme de rendement	The limits within which equipment must operate in order to be classed as serviceable. (DGLEPM). Testing a new development, or in teaching personnel how to operate the actual machine, apparatus or weapon.
periodicity/périodicité	The recurring interval between scheduled maintenance actions expressed in units of time, distance or rate of usage. (DGLEPM)
permissive repair schedule (PRS)/liste des réparations permises	A category of maintenance instructions which provide technical guidance on the extent of repair work which may be carried out at successive lines of maintenance for each class of equipment. (DGLEPM)
petroleum, oils and lubricants (POL)/produits pétroliers (PP)	A broad term that includes all petroleum and associated products. (SSI)
preservation/conservation	The application and use of preservative measures to prevent deterioration resulting from exposure to atmospheric conditions during shipment and storage. (SSI)
preventive maintenance/maintenance preventive	Systematic and/or prescribed maintenance intended to reduce the probability of failure. (NATO)
preventive maintenance time/temps de maintenance preventive	That element of maintenance time during which preventive maintenance is performed. (DGLEPM)

production model/modèle de production	A model in its final mechanical and electrical form of final production design made by production tools, jigs, fixtures and methods. (DGLEPM)
Product Data (PD)/ données sur le produit (DP)/	Technical information provided by the Original Equipment Manufacturer (OEM) or generated by the In-Service Manager of the EMT, for use by the operators and maintainers of the equipment. The vast majority of PD is in paper form in Technical Manuals (TM) and Spare Parts Lists (SPL) but the new trend is towards electronic creation, storage and delivery of technical information in the form of the Logistic Support Analysis Records (LSAR), Integrated Electronic TM (IETM) and Interactive SPL (ISPL).
project director (PD)/directeur de projet (DP)	The officer who is the project sponsor's working representative and who provides or obtains guidance and direction for other working level staffs on matters relating to project aims. (DPMS)
project manager (PM)/administrateur de projet (AP)	Person formally appointed to manage a project with specific accountability for achieving project objectives within defined resources. **NOTE**: During the project implementation phase, the Project Manager is the Deputy Project Leader. (DPMS)
project officer/officier de projet	An officer appointed to perform specialist functions in support of a project, and who responds to the needs of the Project Director and/or Project Manager. (DPMS)

prototype/prototype	A model suitable for evaluation of design, performance and production potential. (DGLEPM)
random failure/défaillance sporadique	Any failure whose occurrence is unpredictable in time. (DGLEPM)
reaction time/temps de réaction	That element of uptime needed to initiate a mission measured from the time the command is received . (DGLEPM)
reallocate/réaffecter	To reassign equipment requiring maintenance from one maintenance organization directly to another maintenance organization. (DGLEPM)
rebuild/reconstruction	The part of maintenance that extends the life of an item, or equipment, to DND specification for renewed assurance of reliability by stripping to determine the condition of components and by replacing or restoring components using parts of acceptable quality which may not necessarily be equivalent to those of the original manufacturer. (DGLEPM)
reclamation/ recouvrement	The saving or rescuing of condemned, discarded or abandoned materiel (salvage) and of materials contained therein for re-use, rebuilding or scrap. (DGLEPM)
reconditioning/remise en état	That corrective maintenance activity which restores an item to a minimum standard of function, for a limited life expectancy. This work may involve cannibalization for used replacement parts, the adoption of parts from other items, or the fabrication of repair parts when new items are not available. (DGLEPM)

recovery/récupération	The extrication of an equipment casualty and, if necessary, its removal to a place where it can be repaired or evacuated. (NATO)
redundancy/redondance	The existence of more than one means for accomplishing a given function. Each means of accomplishing the function need not necessarily be identical. (DGLEPM)
reliability/fiabilité	The ability of an item to perform a required function under stated conditions for a specified period of time. (NATO)
repair/réparation	That corrective maintenance activity which restores an item to serviceable condition by correcting faults or replacing unserviceable pieces of the item with new, overhauled, rebuilt or reconditioned components. (DGLEPM)
repair and overhaul (R&O)/réparation et révision (R&R)	The act of returning an item to a serviceable condition by disassembly, repair or replacement of damaged or deteriorated parts, reassembly, adjustment, examination and testing to specified standards. Whereas repair normally entails the correction of specific defects only, overhaul entails not only the replacement of worn and damaged parts but also of parts whose service life has expired or is about to expire, in order to return the item to its original performance and an acceptable life expectancy. (CFTV)
repair part/pièce de rechange	An individual part, sub-assembly or assembly supplied for the maintenance or repair of systems or equipment. (AV)

repairability/réparabilité	The probability that, when maintenance action is taken, a failed item will be restored to satisfactory operating conditions within a specified downtime, with given manpower expenditure, and employing average skill levels. (DGLEPM)
repairable /réparable	The condition classification assigned to an item which, as a result of the application of maintenance, financial and supply management criteria by qualified inspection, is determined to have a repair potential. (DGLEPM)
repairable item/articles réparables	An item of materiel which is designated as capable of being repaired. (SSI)
repairable reserve/reserve réparable	Repairable equipment retained in stored reserve for future requirements or pending the availability of repair facilities or pending disposal authorization. (SSI)
replace/remplacer	The part of maintenance that exchanges unserviceable assemblies or parts for serviceable assemblies or parts. (DGLEPM)
retrofit/rattrapage	The addition of technical or operational performance changes to an equipment or system after production. (DGLEPM)
robbing/emprunt de pièces	The controlled removal with intent to replace of serviceable repair parts from an equipment, as the expedient method of restoring another equipment to a serviceable condition. (CFTV)
route clearance/dégagement d'itinéraire	The recovery task of clearing disabled vehicles and other equipment from a main supply route. (DGLEPM)

salvage/récupération	The re-usable materiel contained in damaged, condemned, discarded or abandoned equipment. (CFTV)
scaling/établissement des barèmes	The process required to assess and calculate requirements for repair parts. (DGLEPM)
scrap/rebut	Materiel that has no real value except for its basic materials content. (SSI)
service lubricants/lubrifiants de service	Lubricants which are used within the CF logistics system. Proprietary materials and compounds produced to military specifications are included. (DGLEPM)
service tests/essais de service	Tests of an item or system of materiel conducted under simulated or actual operational conditions to determine to what degree the item or system meets the military requirement. (DGLEPM)
serviceable/utilisable	The condition classification assigned to an item, which can be used without restriction for its intended purpose. (CFTV)
servicing/entretien	The part of maintenance which consists of the systematic cleaning/adjustment, replacement of a limited number of specified parts, replenishment and lubrication performed at regular, or required intervals to retain an item of equipment in serviceable condition. (DGLEPM)
servicing time/temps d'entretien	That element of downtime during which the item is being serviced. (DGLEPM)
set/dispositif	An equipment together with the accessories or attachments required to enable that equipment to perform its operational function. (DGLEPM)

shelf life/durée d'entreposage	The length of time an item of supply can be stored under specified environmental conditions and continue to remain suitable for its intended purpose. (SSI)
software/logiciel	The totality of programs usable on a particular kind of computer, together with the documentation associated with those programs. (DGLEPM)
software engineering/ingenirie du logiciel	The systematic approach to the development, operation, maintenance and retirement of software, including requirements definition, design description, program development, testing and implementation. (DGLEPM)
software maintenance/maintenance des logiciels	The correction of errors in software systems and the optimizing and remedying of inadequacies in runninq software. (DGLEPM)
specification/specification	A clear and accurate description of the technical requirements for materiel, a product or service, including the procedure by which it will be determined that the requirements have been met. (DGLEPM)
special inspection/inspection speciale	A one-time inspection used to determine if an unsatisfactory condition exists. When applicable, the inspection may include the necessary corrective action. (DGLEPM)
standard/norme	A document that establishes engineering and technical limitations and applications for items, materials, processes, methods, designs and engineering practices. (DGLEPM)

standard repair time (SRT)/temps normal de réparations	The number of man-hours required to perform a maintenance task using trained technicians under ideal operating conditions. The SRT for each task includes the time for any preliminary procedures necessary to gain access to the component assembly. It does not include time to obtain tools, parts and information or travel. The SRT assumes that the minimum crew remains with the equipment and is available to aid the technicians. (DGLEPM)
standardization/ normalisation	The process of developing concepts, doctrines, procedures and design to achieve the most effective levels of compatability, interoperability, interchangeability and commonality in the field of operations, administrations and materiel. (AAP-6)
sub-assembly/ sous-ensemble	Two or more parts which form a portion of an assembly or a unit replaceable as a whole but having a part or parts that are individually replaceable. (DGLEPM)
supply delay time/delai d'approvisionnement	That element of delay time during which replacement parts are not available at the place of demand. (DGLEPM)
supply reaction time/temps de réaction de l'approvisionnement	That element of time measured from the receipt by the supply system of a user demand until the handover of demanded materiel to the transportation agency. (DGLEPM)
system/système	A composite of equipment, skills and techniques capable of performing and/or supporting an operational role and managed in its entirety by one systems manager. (LCMSGM)

testing/essai	That part of maintenance that consists of the comparison of the operation of an item or equipment to a specified standard. It may involve the use of gauges and test equipment. (DGLEPM)
tool crib/ratelier d'outils	A facility established within or adjacent to work areas to provide tools and tests equipment to technicians on temporary issue. (SSI)
trouble-shooting/recherche des pannes	The process of locating the causes of equipment unserviceability and determining the necessary corrective action. (DGLEPM)
unditching/transfert	The return of a vehicle, immobilized by inadequate traction or obstacle negotiating ability, to a place from which it can proceed under its own power. (DGLEPM)
unit (technical)/unité (technique)	An assembly, or any combination of parts and sub-assemblies mounted together, normally capable of independent operation in a variety of situations. (DGLEPM)
unserviceable/inutilisable	The status of an item which is not ready to be used for its intended purpose without undergoing servicing, repair, modification or other maintenance. (DGLEPM)
upgrade/amélioration	To improve equipment performance. (DGLEPM)
uptime/temps de fonctionnement	That element of active time during which an item is on alert, reacting, or performing a mission . (DGLEPM)
uptime ratio/taux de temps de fonctionnement	The quotient of uptime divided by uptime plus downtime. (DGLEPM)

user trial/essai d'utilisation	A series of tests performed under operational or simulated operational conditions to determine the military suitability of an item. User trials include functional operation, maintenance analysis and troop trials. (DGLEPM)
weapons system/systèmes d'armes	A weapons system is composed of equipment, skills and techniques, the composite of which forms an instrument of combat. The complete weapons system includes all related facilities, equipment and maintenance of the system, so that the instrument of combat can be considered as a self-sufficient unit of striking power in its intended operational role. (LCMSGM)